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Gas Supply: An American Experts Proposals Critically Discussed by an English Expert

A very prominent American gas expert recently submitted some interesting suggestions to English experts, whose opinions were not altogether in harmony with his. Some note son the points of differences may, therefore, be both useful and interesting. The proposal suggested, if adopted, would result in very radical alteration, both in the nature of the gas supplied to the public and in the mode of producing it at the gas works. It is known that in the distillation of coal for the manufacture of lighting gas benzenes are produced, and that these bodies can also be used as liquid fuels for modern forms of locomotion. The American expert pointed out, and the statement is not questioned, that town gas, as now produced, contains a considerable amount of benzols, estimated at an average of 2½ gallons for every 10,000 cubic feet of gas. Also, that a very considerable percentage of the gas supplied by public bodies and companies is burnt either as fuel for gas engines, for heating in ovens and stoves, or for lighting with incandescent mantles. Further, he estimates the percentage consumed in the old-fashioned batswing, or fishtail burners at 5 per cent. The innovation advocated is that the benzol, which contributes valuably to illumination should be washed out of the coal gas and that the public should be supplied with gas which has no longer in itself any appreciable illuminating power. The American expert is quite right in asserting that, from the scientists' point of view, it is certain that it is supremely wrong to use an important and valuable product, such as benzol, solely for the purpose of a fuel, whilst very much cheaper materials, quite as efficient in the bulk of cases, are readily at hand. English experts assert, in opposition to the American view, that we must look upon modern gas works as an industrial concern and not merely as a scientific problem. In English towns, it has been pointed out, the percentage of gas now consumed in the simple, old-fashioned burners was probably as much as one fifth of the whole produced. Under the conditions now pertaining to the manufacture of coal gas in English gas works, it is probable that the benzol contents are not much over 2 gallons for every ton of coal carbonized, practically 2 gallons of benzol for every 10,000 cubic feet of gas. The American estimate is that it would cost 24 cents to wash out the benzol from 10,000 cubic feet of gas. Put slightly differently the recovery of about 2 gallons of benzol would cost 24 cents, and assuming that a sale price of the finished product would be 28 cents per gallon at the works, there would be credit of 32 cents per ton of coal dealt with. If the removal of these valuable hydrocarbon liquids left the gas as valuable as before, except with regard to its inherent illuminating power, the problem would not be a difficult one. English experts assert the fact is that, unless adjustments were made in some other way, the gas consumers would be getting about 5 to 6 per cent. less heat value in their fuel than previously. Thus, instead of burning 10,000 cubic feet to do a certain amount of say cooking or lighting with mantles, they would require an extra quantity without extra charge. Taking gas at 50 cents per 1,000 cubic feet, this 600 feet would be the equivalent of 30 cents.

Let us assume that the system of producing the gas be carried on as it is at present, and that the benzene bodies are washed out at the municipal or other gas works; also that the gas consumers obtain an allowance in price reduction, approximately equivalent to a reduction in heating value; then it necessarily follows, from the English point of view, that the gas consumers obtain a gas which they can no longer use for illuminating purposes without a mantle, and in heat value they would be obtaining just change for 24 cents, while the gas works' owners would be adding to their plant and responsibilities without making any profit whatever. All in order that a fuel may be produced for use for motor engines at a somewhat lower price than that at which it can be obtained at the present time from other sources. Unless there are some other factors, which have not been taken into account and which seriously affect these calculations, the proposals which have been submitted to English gas experts for consideration have not appeared very attractive to them; the subject was approached with open minds. It will be admitted that, in view of the growing requirements for gas for purposes where heat alone is needed, there is little doubt that before long it will become necessary to attach more importance to the heat value than to the lighting power of our public gas supplies. It can scarcely be assumed that the Government would permit the existing gas companies to work without any restrictions; but, assuming that the candle power standard were to be modified or removed, and a heating value standard were substituted for it, then, it is asserted, that gas works' managers would have to face quite a new condition of things. It should not be lost sight of that the capital, which is sunk in the existing gas works, is so enormous that any sudden alteration of policy would involve great responsibility, and could scarcely be made unless an overwhelmingly strong case were made out for it. The function of a gas works will remain that of turning out the largest possible quantity of heat units from each ton of coal with whatever requirements of heat contents per volume may be imposed.

In the opinion of English experts, looking years ahead, and for a long time to come, the main policy of the public gasworks must be gas, first, with by-products (as their name implies) a secondary consideration. The production of a modified form of coke, a coalite like fuel is raising ever-increasing attention, and this may also become a matter, which may have to be considered in future developments. In the production of coalite fuels, the fuel and the by-products will be the chief consideration, and the gas the secondary consideration, or by-product; a thorough inversion of the present system. Undoubtedly the proper place for coalite fuel production (using the word "coalite" to typify cokes containing some residual amount of volatile matters and igniting at a low temperature), is in the immediate vicinity of the coal pits. As all the ash of the coal is left in the coke, it is probable that washed fuel will be employed, and indeed, if use is to be made of many of the low grades of fuels and "smalls," such washing will be necessary to yield a satisfactory product. A low temperature distillation is of necessity essential for the manufacture of such fuels, which yield a relatively limited volume of gas, very rich in volatile liquid constituents. After the removal of these valuable liquids the gas remaining would be used, in so far as was necessary, for retort heating, and the excess, where circumstances permitted, for generation of power for use in the immediate vicinity. It will naturally suggest itself to readers that the solid fuel and the liquid products must together make the scheme profitable, because there is no outlet of sufficient size for town's gas in view of the way in which most countries are already divided up and monopolies granted for gas supply. Neither can a combined scheme for utilizing the gas for power generation for public power supply have much chance of success, because less expensive types of plant, such as the Mond gas producer, are preferable for power production. In these plants comparatively low grade fuel is burnt under the best possible conditions, to return a maximum yield of sulphate of ammonia per ton of coal used and a maximum number of heat units in the gas per ton of coal consumed, the gas, however, being of comparatively low heat value per foot, hence quite unsuited to compete with town's gas for the purposes for which town's gas is chiefly employed. It must follow, from the above, that the most profitable and desirable treatment of a coal supply resolves itself into three quite distinct businesses:

(a) The production of town's gas of the standard heating value.

(b) The distillation of coal under such conditions that the coke and liquid portions of the distillate are the maximum average yield and value.

(c) The gasification of the coal where the maximum value in heat units is required in the resulting gas (independent within the limits of thermal value per cubic foot), with a maximum yield of ammonia, which alone of the by-products receives consideration.

The Development of Medium or Small Sized Properties from an Operative Standpoint.

[By Mr. J. A. Patten, read before the Twelfth Annual Convention, Wisconsin Gas Association, May, 1913.]

The subject of this paper is so broad, and has so many different phases, that it is my intention to touch only those points which I consider, from personal experience, to be of vital importance in the development of small or medium sized gas properties.

The history of our industry for the last few years has been one of unprecedented development. We have not only been able to reduce the cost of operation, while maintaining the highest standard of efficiency in the physical condition of our plants and distribution systems, but it has been possible to give the public better service and to furnish our commodity at a much lower price. Modern methods in the production, distribution, and application, have been the means of meeting the demand for more and better service. The operator of to-day has not only educated the public thoroughly into the use of gas, but has made this necessity possible to all, so that the house that is without it, is hardly of any consequence, from a tenant's view. How differently our business was conducted some years ago. Many of us can look back and see the wonderful strides we have made, how step by step, and year by year, we have gradually built up our business, until to day our securities, from an investor's standpoint, are the very best. This, I believe, has been made possible to a great extent by the evergrowing consolidation of the small properties into parent or holding companies; which through their modern business methods and superior organizations, have not only been able to provide sufficient working capital with which to carry on their extensions, but invariably they have, through engineering and operating departments, been able to bring up efficiency in operation to a point which has been a benefit to the stockholder as well as the consumer.

It has either been my good fortune or misfortune (I have always considered it good fortune), to have filled the position of superintendent or manager of several small properties, in as many different locations, each of which had its own peculiar share of difficulties to contend with, before they were put on a paying basis. In most instances, they were formerly controlled by local capital, and as the improvements in the production of gas and new business methods came along, with the evergrowing demands of the public for better and cheaper service, the local owner was forced to conform with these requirements or sell out. In most instances, he was glad to dispose of his holdings, as he did not care to put additional funds into what he considered a side line. The property generally had run down to a point where it was impossible to deliver service to the consumer and satisfy his wants, let alone paying dividends. Invariably, the out-going local operator in charge had his excuses; but it was very apparent from the physical condition of the plant and the way business had been conducted that some one had gotten in a rut, and was satisfied to drift along without making an effort to better his or the company's condition. He had not only lost his grip, but his environments (which were possibly brought on by himself) were such, that he had gradually lost his initial energy and ability to develop the business, and had become satisfied, or dissatisfied, as the case might be; the consequence being that his whole organization, down to the stoker, became infected with the same disease. The business was conducted in a slip-shod manner; accounting ran loosely, allowing unpaid bills to accumulate; improper care of records, neglected business appointments; dirty and dingy office and display rooms; and, above all else, inattention to complaints, and other things too numerous to mention. As a rule, the distribution system was in bad shape, either partially filled with naphthaline or water, or showing a 20 or 30 per cent. leakage. In one city, the distribution system had been laid and 43 drips installed 5 years previous, but for some reason or another, the street department had neglected to put in risers for the drips. Upon trying to find records of locations, was advised that the only ones were stored away in the street foreman's "nut," and if any information was wanted, it would be necessary to go to him.

In this same place, the mains were badly obstructed with naphthaline and water, and in one outlying neighborhood, in three consecutive blocks, it was discovered that every service (36 in all) was partially or wholly choked with naphthaline and had been that way for at least 18 months. Upon investigation, of what appeared to be ignorance, or carelessness of the company's employees, I was advised by the consumers that they had repeatedly complained of poor service, and that occasionally a man had called, but had never been able to better conditions, so finally they had given up in despair and turned back to their wood or coal stove.

These conditions existed not only in this particular neighborhood, but were general in other sections of the city, to such an extent that the word service, when used in connection with the gas company, was treated by the public as a joke.

In the manufacturing departments it has been the same. Old, dilapidated buildings and machinery; yards in filthy condition; irregular charges; poor gas; high heats; booze and other things; with all of which no doubt you have come in contact in the course of your experience.

In one property the plant was in such deplorable condition that it was a wonder how they had been able to operate at all without the question of efficiency and quality of production. The plant referred to had a daily sendout of 325,000 cubic feet. Its condensing capacity consisted of one 6-foot by 12-foot primary condenser, and one 42-inch by 12-foot secondary condenser, one 42 inch by 12-foot combination washer and condenser (with washer section out of commission most of the time). It had neither washing nor scrubbing capacity. The gas passed through the station meter at a temperature at times as high as 100°. It had been necessary to steam out the yard piping and apparatus at least every 9 days, and it was a common occurrence to remove 12 or 15 wheelbarrows of naphthaline after each steaming operation. On account of the excessive back pressure caused by naphthaline, paraffine had been substituted for water in the lutes of the purifying boxes, and the station meter was trying to perform two duties at the same time, acting as a condenser and measuring the

make. This meter was out of commission 60 per cent. of the time for one year. The yard piping and a 2-lift holder leaked so badly that it was necessary to put them out of service, the holder alone showing a leakage of 180,000 cubic feet per month.

In describing these conditions, it is not my wish to offer criticisms, other than to bring out the fact that the development of the small or medium-sized plant depends greatly upon the man in charge. While the directors or owners may be partially to blame, I believe, primarily, that the local operator, the man who is the very backbone and heart of the organization, is, in most instances, to blame for the non-development of the property of which he is in charge, if he lacks aggressiveness and energy and fails to grasp and absorb modern ideas and methods pertaining to the commercial and production ends of the business.

It was evident, from the attitude of the public and the way the business had been conducted, that the company could not be benefited if it continued along the same lines as previously, and it was deemed advisable to take advantage of the other fellows' mistakes and adopt liberal policies and modern commercial and operating methods. The policy adopted was one of absolute honesty and frankness towards the public, as far as it did not interfere with the inner workings of the property. The word gas was made secondary, and the word service substituted, for it is obvious that the question of service plays the most important part in the upbuilding of public utility corporations. It is a factor that should be taken under serious consideration, as it can very easily make or break you, according to the quality supplied. The more efficiently, thoroughly and courteously we fulfill our obligations to the public, the more profitable it is to both parties concerned. Finally, the knocking and criticisms which have previously prevailed will disappear, with business going ahead by leaps and bounds, with the public doing the boosting.

A study of the successful small company will generally disclose the fact that the manager or superintendent in charge has an efficient organization, is aggressive, energetic and above all things on the job. He must be capable of surrounding himself with the most efficient and least number of employees for good operations, and with as few department heads as possible. In selecting the heads for the different departments it was thought preferable to employ local timber, with the object of training them to conform with the ideas and methods adopted. Each employee holding a responsible position was given to understand that his future success depended upon his ability to perform his duties; that each individual would be held responsible for his share of the work, and that the success of the business depended primarily upon his efforts. They were treated as part of the organization and were given to understand that they had the privilege of coming to the man in charge with any criticisms or suggestions pertaining to the bettering of conditions in their respective departments. The benefit derived was two fold, whereas previously there had been more or less friction and discontent. In time the atmosphere cleared entirely, and instead of having a lot of disgruntled employees, we had a working organization that was a veritable wedge; everybody on the job; everybody doing something; and, above all, a spirit of loyalty prevailed, which in itself was a valuable asset to the company. Much more could be said about our working organization, and possibly some of you may differ with me as to the above disposition of employees; but a manager that has the judgment to size up a piece of good timber, and the tact to make it a finished product, has gone a long way in the building up of his organization.

New business has been discussed so many times before gas associations, that I will touch upon it but lightly. It has always been found advisable to advertise regularly, not spasmodically. The number of salesmen depends upon local conditions, but ordinarily one salesman for every 10,000 population has been found ample. The salesmen are employed steadily the year round and all appliances, piping, and services, etc., are sold at a profit, because this department should pay its own way. In a town up to 30,000, the local manager can fill the position of new business manager in addition to his other duties. It is the writer's opinion, that the appearance and condition of the display room and office have much to do with the success of this department, and nothing but the very best equipment, such as furniture, fixtures and appliances, should be installed, and above all things, the illumination should be the shining light in that section of the city in which it is located.

In the accounting end, the necessity of eliminating as much red tape as possible, should be taken under consideration. While, at times, the records kept by small companies are apt to be neglected, the best of judgment is needed to know how far, and to what extent, the records shall be carried, in order to eliminate unnecessary expense in bookkeeping and making out reports. We all know the importance of having a complete set of records at our finger points, but it is often possible to overburden the small plant with unnecessary system and records.

We all know the remedies for excessive leakage, naphthaline, poor pressure, etc., in our distribution system, and I will not dwell on it, except to say that prompt attention should be given to all complaints. If they are due to faulty construction, eliminate permanently by reconstruction. A great many more things could be said about the trials and tribulations of the local operator, and of the whys and wherefores of the adverse conditions described in this paper. But I believe after these matters have been threshed over thoroughly, the writer's contention would still hold good, that the local operator is largely responsible for the condition of his property.

Manufacture of Pipe for Oil and Gas.

[Abstracted from a paper read by MR. F. N. SPELLER, at the Cleveland Convention, Natural Gas Association of America.]

This is now a highly specialized branch of the iron and steel industry which, including all tubular goods, aggregates a production of over 2,000,000 tons per annum, and thus compares in importance with the steel sheet, plate, or wire industry. The growth of the pipe business in this country has been largely due to the great developments in oil and gas, and it will not be out of place to describe briefly and illustrate the manufacture of welded pipe and some of its more important characteristics, for it tends to a better understanding for each party to have at least a general knowledge of the other's business. Welded pipe requires a uniform grade of metal having good welding qualities, and capable of standing high temperature of the welding furnace. Puddled iron was the only metal available for this purpose until about 20 years ago, when it was found possible to use soft steel, when made to certain specifications, and later on it was found that extraordinary uniformity could be obtained, compared with what was possible with wrought iron. This meant less loss in manufacture, through blistering, laminations, bad threads, etc., also stronger and more uniform welds and lower costs.

Welded pipe is made either by the butt or lap-weld process. For either, the metal is rolled into long plates, termed skelp, the width approximating the circumference of the pipe.

In the *butt weld process* the skelp is heated to the welding temperature, on the flat hearth of a regenerative furnace, and when at a good welding heat, the up-turned end of the skelp is caught in a suitably shaped pair of tongs and pulled through the die, forcing the edges together and welding the seam. This operation is illustrated in Fig. 1. After welding, the pipe is given the correct diameter by

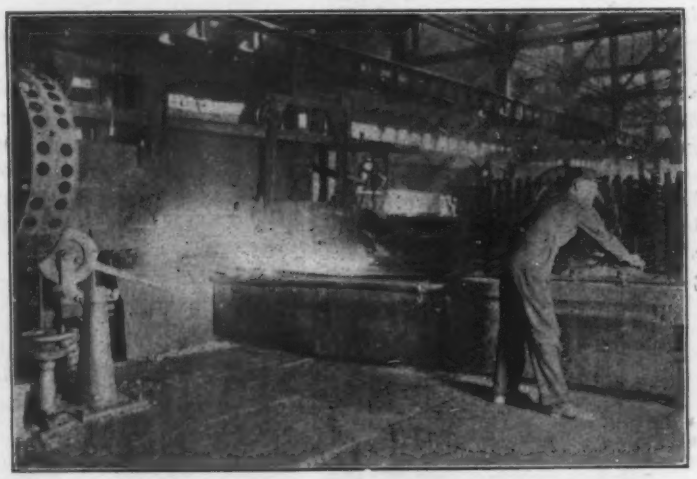

Fig. 1.—Drawing Butt Weld Pipe.

passing through a pair of rolls with semicircular grooves, and then through cross-rolls to straighten it and give a good finish to the surface. This is illustrated in Figs. 2 and 3, which show the rolls on a larger scale in connection with lap-welding.

The *lap-weld process* involves two operations: First, bending of the skelp so that the edges instead of butting, lap over slightly, and then reheating and welding on a mandrel held loosely in position inside the pipe. The welding rolls are placed close to the front of the weld-

Fig. 2.—Sizing Rolls.

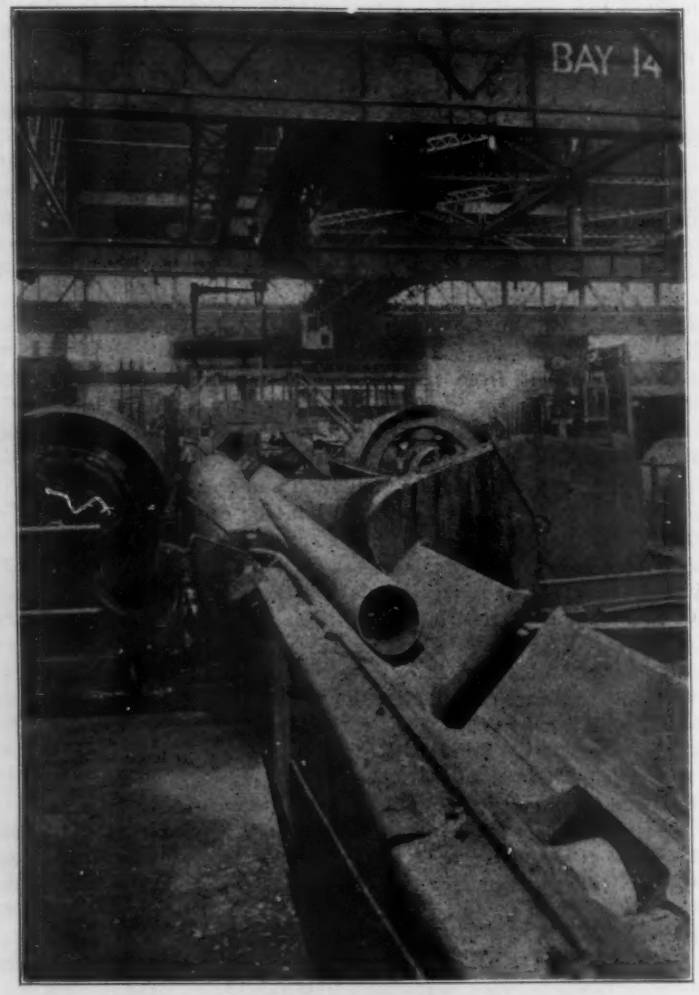

Fig. 3.—Cross Rolls.

ing furnace, as shown in Fig. 4, which also shows mandrel in position. The sizing, straightening and finishing are carried out as described for butt-welding, after which the pipes are slowly rolled on a cooling-table until cold enough to handle. The rough ends are removed by cold saws, the crop ends being utilized in some cases for test purposes. Each length is carefully inspected, inside and out, for injurious defects. After threading and reaming, each piece is tested by internal hydrostatic pressure. The pressure used varies with the diameter, thickness, or use to which the pipe is to be put, varying from 450 to 3,000 pounds per square inch. Pipe for special purposes, such as certain kinds of oil well tubing, casing, line pipe and drill pipe, are given a flattening test. The drop ends cut from each piece are placed in a press with the weld 45° away from the side and crushed down until the opposite outside surfaces are brought together within one-third the outside diameter. Failure to stand this test, either in the metal or weld, requires another cut to be taken from the defective end, which, if this also fail, results in the length being rejected. This test assures that each piece is up to a high standard as regards ductility and weld. The following are the main properties of wrought iron and steel as used for pipe:

Chemical Composition.

	Steel, Per Ct.	Wrought Iron.
Carbon..	.07	Trace and upwards.
Manganese	.30	Trace.
Phosphorus	.100	.170
Sulphur	.045	.030
Oxides and slag	.06	2.00

Physical Properties.

Tensile strength,	57,000 pounds per square inch.	46,000 lengthwise.
	(Transversely or otherwise)	34,000 transversely.
Elongation in 8 inches,	22 per cent.	10 per cent. lengthwise.
		Less than 8 per cent. transversely.

A series of tests by Prof. R. T. Stewart showed the relative internal bursting strength of steel pipes and tubes as follows: For butt-welded steel pipe, 73 per cent.; for lap-welded steel pipe, 92 per cent., and for seamless steel tubes, approximately 100 per cent. In steel pipe, then,

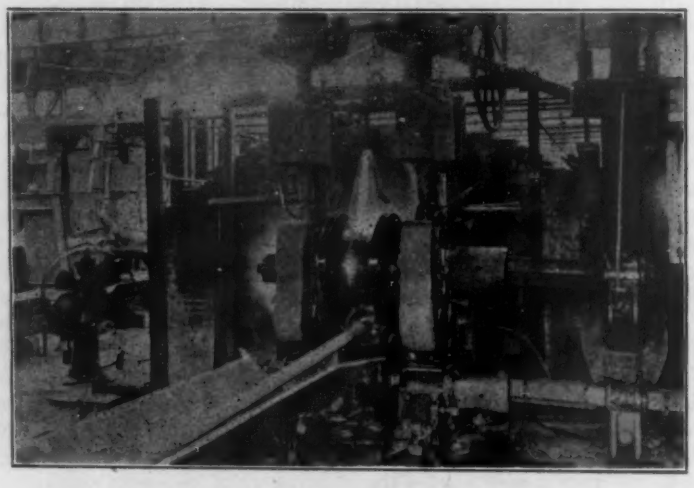

Fig. 4.—Welding Rolls—Lap-Weld Process.

the strength of the butt weld is about 80 per cent. of that of the lap-weld. The relative strengths of wrought iron and steel pipe were as follows: Butt-welded, wrought iron, pipe is 70 per cent. as strong as similar butt-welded steel pipe; and lap-welded wrought iron pipe is 57 per cent. as strong as similar lap-welded steel pipe.

The only important difference of opinion regarding pipe is on the question of corrosion. For some time after steel pipe was introduced there was, of course, lack of direct evidence from service tests, so that conclusions were rather hastily formed from general observations on iron and steel.

Steel pipe lines have now been in use for nearly 20 years, so it is reasonable to expect comparative results from service. In order to interpret observations, and form a correct conclusion regarding corrosion, it is important to have a clear conception of what is going on when iron rusts. The chemical, or, more strictly speaking, the electro-chemical reaction, may be divided into two stages: First, solution of a small portion of iron; and, secondly, oxidation of this iron to ferric hydroxide, commonly known as rust. The red oxide thus

formed is insoluble, therefore, when precipitated, leaves the way clear for more iron to enter into solution, and for the further combination of iron with oxygen. These reactions will continue as long as there is any oxygen, water and iron left. The absence of either water or free oxygen makes corrosion impossible. The rate of corrosion depends, among other things, on the amount of each of these elements present; and is governed principally by the temperature and character of the water, galvanic action between dissimilar materials, electrolysis from stray electric currents and other minor influences. It is evident then, there is nothing remarkable in the fact that pipe will sometimes last 20 years, and show no serious damage, while in other places perhaps not far away, it will be perforated in a year or so. This was the experience with wrought iron pipe before steel was thought of, and has been the experience with both materials since.

The rate of corrosion is much more dependent on conditions external to the metal than on variations in the metal itself. In order, then, to form a correct conclusion it is of prime importance to know whether all the conditions surrounding the pipes were the same in every particular. Laboratory tests, conducted under approximately natural conditions, were satisfactory, so long as there was no better evidence from practical experience (acid tests are not referred to here, as they are usually very misleading). Based on several years of investigation in the laboratory and field, the National Tube Company, 6 years ago, decided to discontinue the manufacture of wrought iron pipe entirely. It may be of interest to outline the character of the investigations which led to this important departure in practice. Opinions and so-called experience, unsupported by actual comparisons of the 2 materials under the same conditions, were ignored as inconsistent and misleading. Ever since steel pipe has been made, lap-welded wrought iron couplings have been used, on account of the tendency of steel to gall, and perhaps because the tapping machinery was in earlier days, better able to thread the wrought iron; so where local corrosion occurs in pipe lines there is always some of each material present. Further, as steel pipe came more generally into use, it was a common incident to make up pipe of both materials in the same line. The latter, under internal corrosion, affords the best posaible comparison, and fortunately hundreds of such cases have been found. All these investigations have shown that practically no difference exists between wrought iron and steel pipe in general, in respect to corrosion.

From what has been said on the cause of corrosion it will be apparent that to stop the action on oil and gas lines, water must be excluded from the surface of the metal.

Some pipe is now made with a protective coating put on at the mill, which is applied as follows: The pipe is first cleaned and dried, and, while still at a temperature above the boiling point of water, it is dipped into a hot bath of special refined bituminous compound and kept there until the pipe has the same temperature as the bath. On removal from the bath the pipe is allowed to drain vertically and cool, leaving the pipe covered inside and outside with an elastic compound, the consistency of which can readily be adapted to the temperature conditions under which the pipe is to be used. For gas lines, the compound is applied outside only. By a second operation this enamel-like surface may be wrapped with a strip of fabric, saturated with the hot compound. The fabric is wound spirally over the surface of the pipe, overlapping about 1 inch on each turn, covering and firmly adhering to the body coat. Two or 3 thicknesses may be applied in this way to meet special conditions. The average thickness of ordinary plants or bituminous dips rarely exceeds 1/100 of an inch, but in the case of 1-ply National Coating the thickness is 3/64 of an inch. The saturated fabric affords considerable protection against damage to the coating through impact or abrasion and protects the foundation coat. When the wrapping is injured by handling, it can be readily repaired in the field, by application of strips of fabric saturated with the compound.

The Corrosion of Cast Iron.

[From a paper by Mr Richard H. Gaines, Chemist to the New York Board of Water Supply.]

Generally speaking, cast iron resists corrosion better than any other form of iron or steel, the close-grained iron being less acted upon than the more open-grained varieties. Why some cast irons corrode faster than others, when subjected to the same conditions, how the corrosion can be minimized, and the influences which promote this trouble, are all questions of vital interest. Unfortunately, iron is subject to deterioration by oxidizing more than any other metal, and the effects are much aggravated by the fact that the oxide formed lacks the property of adherence which, in the case of other metals, limits oxidation to a superficial film, the oxide itself forming a protective coating for the interior of the mass. The precise influences which operate, and the changes which occur when iron rusts, have formed the subject of a number of scientific investigations, but it cannot be said that any final agreement has yet been arrived at as to their exact nature, although the electrolytic theory of corrosion is now provisionally accepted by most authorities.

The two essential factors which determine the corrosion of iron in water and in aqueous solutions are the presence of water and of oxygen. No rusting takes place either in air free from moisture or in water free from air. While it has been proved that carbon dioxide is not, as was formerly held, essential to the process, it may be stated that any acidity increases the rapidity with which corrosion takes place, and the presence of alkaline substances, such as lime, inhibit rusting. The latter fact is of the utmost importance in connection with the use of iron and steel in concrete.

Dr. H. M. Howe says: "Electrolytic action surely hastens corrosion very greatly, and in practice it may well be true that nearly the whole of corrosion is electrolytic." The writer has always believed that the only corrosion of iron that proves destructive, save that due to stray electric currents, is due to differences of solution pressure at different parts of the metal. The subsidiary constituents of iron and the presence of rust films or even protective coatings, where flaws arise in them, act energetically in promoting decay. When two different substances are separated at one point by a liquid in which one of them is soluble, and are connected at some other point, an electric circuit is formed, similar to that produced when the poles of of an electric cell are connected. The electric energy is derived from the solution of the material; that is, from chemical action which would otherwise result in evolution of heat. Such electrolytic action invariably manifests itself when moisture, impregnated with acids from the atmosphere, or salts in solution, obtained access to two different constituents of iron, and can even take place between iron and rust, or between iron and paint, if the latter is so far deprived of its oily covering as to become a conductor. Cast iron, for example, with its insoluble graphite and relatively soluble ferrite, affords a typical medium for such action in water, or any electrolytic solution. Again, when iron is in contact with another metal, a similar action may take place. It does not follow that the iron in all cases will be the material which is dissolved by electrolytic action, but in all ordinary cases, except when zinc is the material, it is the iron which suffers solution. The following law applies:

(*a*) When iron is in contact with one of ths less noble metals (more electropositive, as zinc), in the series of contact potential differences, and both metals are placed in aqueous solutions producing corrosion, the corrosion of the iron decreases while that of the other metal is accelerated.

(*b*) When iron is in contact with a nobler metal (more electronegative, as copper) in the same series, under similar conditions, the corrosion of the iron is largely increased.

To produce the effects under *a* and *b*, it is unnecessary that there should be sufficient potential difference between the two metals placed in the liquid to lead to a visible decomposition of the water, since the effect is observable at even a very low potential difference, though it naturally increases as this rises.

According to Heyn and Bauer, the contact of iron with copper increases corrosion, on an average, by 25 per cent. in the case of town water supply, the corresponding figure being 47 per cent. in artificially prepared sea water. By special experiments it was proved that the decomposition of water plays no part in the reaction. The copper causes the oxygen in the water to act more energetically upon the iron electrode than when there is no copper in contact with the iron. Where there is no oxygen in solution, the iron, even when in contact with copper, is not attacked. Tests showed that iron in contact with nickel, in water, corrodes about 15 per cent. more than when not in contact with nickel. Other tests showed that cast iron does not protect steels. Corrosion of the latter is decreased 50 per cent. when air is allowed free access to the water surface.

They also found that two specimens taken from the same iron, but worked up differently (by rolling, forging, heating, etc.) and placed in water, in contact with each other, generally show an electric potential difference, and this would tend to prove that that they have a corroding influence upon each other; the iron which happens to be in a less noble state is attacked more energetically and protects the more noble one. Such influences are commonly overlooked by technical men.

It must suffice in a paper of this scope merely to mention some of the corrosive agencies without undertaking to treat them all separately. Iron always corrodes most readily when subjected to the alternate wetting and drying. Several factors contribute to this, the most important of which is that at surface, in contact with the atmosphere, when water is saturated with oxygen, its corrosive powers are consequently at a maximum. Around the water line of bridge columns and other structural work the engineer and painter must therefore give particular heed.

Unprotected cast iron, if long exposed to sea water, undergoes complete disintegration, the iron is dissolved, and a soft, spongy mass of graphite, carbide of iron and other substances is left. Under the influence of electrolytic action, the electronegative carbon is left, while the electropositive iron is dissolved. When exposed to the continuous action of sea water, with more or less complete absence of air, as, for example, at considerable depths below the surface of the sea, it undergoes oxidation to ferrous oxide, becoming extremely soft, although it may retain its original shape. The carbon content of the metal is usually thrown out as a graphite mass, throughout the pores of which the ferrous oxide is lodged. The specific gravity of this material is only about one-sixth of that of the original metal. A classical instance of the corrosion of cast iron in sea water is given by the Swedish chemist, Berzelius. Cannon balls raised at Carlskrona from a ship which had been sunk for 50 years, showed that the metal had been entirely converted into a porous graphite mass, which spontaneously heated when exposed to the air. Many other specific examples of the destructive action of sea water could be cited. However, experiments have demonstrated that cast iron is much more resistant than steel or wrought iron to corrosion in foul water and sea water, while there is little difference in fresh water.

Blast furnaces in different localities produce different qualities of pig iron, according to the ore and fuel available, and the chemical composition of the iron from any given furnace may vary within certain ranges according to the contingencies of smelting. These facts must be borne in mind if corrosion is to be minimized by high quality cast iron. In considering this phase of the subject it is important to remember that iron is a metal which readily combines with or dissolves nearly all the other elements. It is also unique in the fact that very small quantities of impurities suffice to change entirely its physical characteristics. The proper control of unavoidable impurities, their homogeneous distribution, and careful furnace treatment, are precautions that will improve the rust-resistant quality of cast iron. If the metal is left with the skin that comes from the mold, it is less easily corroded than when it has been machined. When iron is cast in the sand some union between the metal and the inside surface of the mold seems to take place, whereby a silicious resisting coating or skin is formed. This skin acts as a preservative coating much in the same way as steel and iron are protected by the film of oxide produced by the Bower-Barff process. Cast iron protected by the natural coating of slag from the molds, resists oxidation well. This is no doubt the secret of the greater resistance offered by cast iron pipes to the destructive action of stray electric currents. The protection afforded by the silicious skin cannot be relied on indefinitely, however, and after it is worn away cast iron may corrode even more rapidly than wrought iron or steel. With the latter condition the superior thickness of cast iron is the factor favoring its greater durability.

At the present time it is impossible to say what constituents have the most influence on durability. The relation of the composition to its resistance to corrosion, has apparently never been systematically studied and little seems to be definitely known on the subject. Campbell and Glassford, of Columbia University, conclude that increase in silicon is attended by increased susceptibility to corrosion, and it is the opinion of others that silicon is the most injurious element. In any event, iron of low silicon, low phosphorus and low carbon content has resisted corrosion, where irons carrying higher percentages of these elements have failed. The following analyses are given as of an iron that successfully resisted serious corrosion for years, and another that failed.

	Sound. Per Cent.	Failed. Per Cent.
Silicon	1.72	2.40
Sulphur	0.085	0.067
Phosphorus	0.89	0.94
Manganese	0.48	0.52
Total carbon	2.45	3.19
Combined carbon	0.17	0.25

Experience has shown that the iron having the greatest density will best withstand the ordinary influences of corrosion. In order to obtain this dense, close-grain iron, the following suggestions are offered: Silicon should be kept as low as is possible and yet have the castings soft enough to machine; the exact percentage depending upon the thickness of the casting, and the character of the mold. The silicon may range from 0.75 per cent. for heavy work up to 2 per cent. for small castings. Combined carbon is a powerful element in closing the grain and giving a dense iron, and it should be as high as possible, still leaving the iron machineable. Manganese had best be kept moderately high, since it also appears to have some beneficial effect.

Sulphur closes the grain, but may give trouble in other directions; as a general proposition, it is better to keep the sulphur low and get necessary density by a proper regulation of silica and manganese. Finally, one of the best ways of closing the grain and securing maximum density, is to put steel scrap in the mixture. This is now common practice with makers of hydraulic castings and is very effective.

Some practical rules laid down by the American Foundrymen's Association for obtaining castings resistant to corrosion are as follows:

1. Use white iron if possible. (White irons are especially useful where any acidity is to be encountered.)
2. If not practicable to use white iron castings, chill those surfaces which are to be in contact with corrosive conditions.
3. If gray iron must be used, get dense, close-grained castings through the use of steel scrap or otherwise.
4. Avoid oxidized metal; use pig irons of good quality, together with good cupola practice. If possible, use deoxidizing agents; for example, titanium or vanadium.
5. Keep the sulphur as low as possible.

Bureau of Standards' Rules for Gas Service.

[Being proposed rules and comments on the same, submitted upon request by the National Bureau of Standards, to the Wisconsin Railroad Commission.]

RULE 1.—No gas meter shall be placed in service until it has been tested by the company, and found correct within 1 per cent. when passing gas at the rate of 6 cubic feet per hour per rated light capacity. Each such meter shall be sealed by the company testing it, with the seal showing the date of such test.

Comments.—A gas meter when being tested is always removed from service; it is, therefore, only necessary to provide that it should not be replaced in service if unduly in error.

An adjustment to plus or minus ½ per cent. is practicable commercially; and, when a meter is in the shop for test, it should be made correct within these limits before being put in service. A less severe limit on meters when removed from service can be made as indicated in a later rule.

If a dated seal of any convenient form is placed on the meter after testing it will be possible to tell from the meter itself how long since it has been tested. This would give a convenient check on the periodic removal of meters for test, and would also enable any customer to satisfy himself that the meter had been checked within a reasonable time. This rule as worded applies to new, repaired and adjusted meters and also to those removed from service for any cause. It might be well to make this clear by the following form for the first sentence:

"No gas meter, whether new, repaired, adjusted or removed from service for any cause, shall be placed in service until it has been tested by the company and found correct within 1 per cent. when passing gas at the rate of 6 cubic feet per hour per rated light capacity."

RULE 2.—Each gas service meter shall be removed and tested at least once every 4 years; and whenever it is found to have an error of more than 1 per cent., or to be otherwise not in good condition, it shall be overhauled and adjusted before being placed in service.

Comments.—The Bureau does not care to submit any comment on the length of period between the routine tests on any meter.

The requirement that all meters be overhauled once in 4 years may be too severe unless the term "overhauled" be defined carefully. The Bureau suggests that the removal and test be required periodically, but that the overhauling and adjusting be required only when

the meter is out of order or in error by more than 1 per cent. Many of the companies may wish to open all meter cases when the meters are in the shop, but a small company, having limited facilities for meter repair work, might find that the requirement to do this was a hardship.

RULE 3.—The original record of every test of any gas meter shall be preserved. The record shall show the reason for making the test, the reading of the meter on removal from service and the result of the test, including all data taken at the time of the test, which data must be sufficient to permit checking the methods employed and the calculations.

Comments.—In a majority of the meter test records the "proof" or meter prover reading is recorded. This is sufficient for the record, and the accuracy of the meter, while easily calculated from this, need not be calculated in most cases. To require a record showing "the result of the test" may be better for this reason than to require a record of "the accuracy of registration."

RULE 4.—Each utility furnishing gas service shall own a suitable meter prover and shall maintain the same in proper condition for use in the testing of meters. The meter prover shall be so located as to be shielded from excessive temperature disturbances, and shall be supplied with suitable thermometers and other necessary accessories.

RULE 5.—Each utility furnishing gas service shall make a test of the accuracy of any gas meter, upon the request of the consumer, provided the meter has not been tested by the company within 6 months previous to the request. A report giving the result of each such test shall be made to the consumer requesting it.

Comments.—The length of time since the last test of a meter on which complaint is made should determine whether or not a retest is to be made by the company. The company might test the meter if requested, even though previously tested within 6 months, but we think it should not be required to do so. In any case an appeal to the Commission is possible when the customer is not satisfied, and thus redress will be secured if overcharge is being made. The Bureau has also considered the desirability of making provision that the customer must agree to accept the company's test as fairly made, or he should not demand that the company make the test free. To make this provision, the following may be added to the first sentence of Rule 5:

"And provided that the customer will agree to accept such test made by the company as determining the basis of settlement for the difference claimed." If the customer is not willing to agree to this, he should appeal to the Commission for the test in the first place. The test records required by Rule 3 would cover records of request tests; the last part of the second sentence of Rule 5 may, therefore, be unnecessary.

RULE 6.—On formal application of any customer to the Railroad Commission, a test shall be made upon the consumer's meter as soon as practicable, by an inspector employed by the Commission. For such test the estimated amount of the required fee shall be forwarded by the consumer when making application; this fee shall be refunded to the consumer by the utility if the meter is found to be more than 3 per cent. fast. The amount of the fee to be paid for each test so made shall be as follows: For each gas meter having a rated capacity not exceeding 10 lights, the test fee shall be $2. For all other gas meters the test fee shall be the actual cost to the Commission of the test.

Comments.—The allowance of an error of 3 per cent. before the customer gets refund of the fee for test seems reasonable. The requirement of greater accuracy at time of setting, and subsequent allowance of greater variation after service, seem better than to follow the plan often used of setting the same limits (plus 2 per cent.) for accuracy at all times. The larger tolerance (3 per cent.) would be especially desirable if such rule as is proposed below (Rule 6a) were in force.

RULE 6a.—Whenever a meter removed from service for any cause is found to be more than 3 per cent. fast, the company shall refund to the customer such percentage of the amount of the bills for the previous 6 months, or for the time the meter was in service, not exceeding 6 months, as the meter was found to be in error at time of removal.

A company is responsible for the condition of its meters, and if a meter is removed and found more than 3 per cent. fast, the customer is entitled to a refund. A uniform rule on this subject may be desirable, as in many cases no such refund is made unless the removal and test have been made on request of the customer.

RULE 7.—Bills rendered periodically for metered gas service shall give the registration of the meter at the beginning and end of the interval for which the bill is rendered, and shall give the dates of the readings of the meter.

RULE 8.—Each utility furnishing gas service must furnish gas having a monthly average total heating value of not less than 600 British thermal units per cubic foot, with a minimum which shall never fall below 550 British thermal units per cubic foot, when tested at any point not less than ¼, nor more than 1 mile from any manufacturing plant of the company. Provided, however, that in cities where the gas sold is manufactured in another city, the tests may be made at or near the center of the consumption in the city where the gas is sold.

Comments.—The works where the gas is made is fixed, and measurement from this point always gives a definite starting point; moreover, the gas will always travel in the ground a reasonable distance before testing, if the testing station is from ½ to 1 mile from the plant. During the first ¼ mile of travel the gas loses practically all of the heating value it will lose before reaching the average customer; in other words, tests at such point are made on gas about as it is delivered, and thus represent better the actual service conditions. When communities are supplied with gas from other cities after a long distance transmission the gas is of lower heating value in such places than near the plant. In such case a special test may be desired at greater distance from the plant than 1 mile; the latter part of the above rule cares for such cases. In these long distance transmission lines, when especially high pressures are used, the heating value losses may be considerable, so that gas, well over 600 B.T.U. at the point of manufacture, will not be up to the standard at the point of sale. In such places it is not always best to require that the 600 B.T.U. be delivered at the end of the high pressure line; but a lower value can often be allowed to advantage, especially if the increase in price necessary for the better quality delivered would overbalance the improvement in quality of service from the higher heating value. The manufacture of an especially rich gas for outlying sections, or for nearby small cities, so that the gas as delivered there will be as good as in the main section for which the plant is making gas, is generally, if not always, undesirable from an economical standpoint. To care for such cases, if there are any such in Wisconsin, the Commission could, of course, allow special concessions as to the heating value required for the outlying cities. If the rating is not made on the basis of the local conditions as to gas pressure, then the following sentence should be added to the heating value to make improbable any misunderstanding of the significance of the value required:

"It is understood that gas of the heating value thus defined has a heating value per cubic foot, metered to each customer proportionately, as much less than 600 British thermal units as the gas pressure in the customer's meter is less than equivalent to 30 inches of mercury pressure, which is taken as the standard pressure for gas measurement." To accompany this, and define the cubic foot of gas, the following rule may be added:

RULE 8a. For purposes of testing, 1 cubic foot of gas shall be taken to be the amount of gas in a volume of 1 cubic foot, when saturated with water, and at 60° F., and under a pressure of 30 inches of mercury.

However, the Bureau would suggest that the following form for Rules 8a and 8, is worthy of very careful consideration; and it may be that it will appear better than the previous form:

RULE 8a (alternate). For purposes of testing, 1 cubic foot of gas shall be taken to be the amount of gas in a volume of 1 cubic foot, when saturated with water and at 60° F., and under a pressure equal to the average gas pressure at the consumers' meters in the city in question. This average gas pressure at the consumers' meters shall be taken as having the following values in the various cities of this State: (Each city where gas is sold would be listed here, with the pressure taken as normal for each, expressed to the nearest tenth of an inch.)

RULE 8 (alternate for last sentence). It is understood that gas of the heating value thus defined, if measured under standard conditions of pressure (30 inches of mercury), would have a heating value greater than 600 British thermal units per cubic foot in proportion as the standard pressure is greater than the normal pressure of the city.

RULE 9.—Each utility the gas output of which exceeds 20,000,000 cubic feet per year will equip itself with a complete standard calorimeter outfit, and shall make tests therewith at least 3 days each week upon the gas supplied to consumers. A record of all these tests shall be made, and kept open for public inspection.

(*Continued on page* 406.)

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NEW YORK, MONDAY, JUNE 23, 1913.

BRIEFLY TOLD.

JUNE MEETING, PROGRESS CLUB, B. U. G.—The June meeting of the Progress Club, Brooklyn Union Gas Company, was held in its rooms, No. 126 Atlantic avenue, on Monday last. In spite of the excessive heat, the attendance more than filled the meeting room, the overflow occupying the hallway. The principal new business, after the election of some 30 new members and the receipt of as many more applications for membership, was the adoption of a Club Button and the appointing of a committee to manage the baseball game, to be played at Ebbett's Field on August 2d, with a team representing the United Gas Improvement Company, of Philadelphia. The formal paper of the evening was an account, by the New Business Manager of the Brooklyn Union Company, Mr. T. M. Ambler, of his recent "swing around the circle," during which revolution he visited Baltimore, Pittsburgh, St. Louis, Chicago, Detroit, Buffalo and Toronto, looking closely over the commercial departments and methods in those cities. After adjournment, light refreshments were served in the temporary show rooms across the street. The text of Mr. Ambler's address appears elsewhere in this issue of the JOURNAL.

CONFERENCE ON WEIGHTS AND MEASURES.—The Eighth Annual Conference on Weights and Measures, which was held in Washington, May 14 to 17, was attended by representatives of the various States and cities that have departments regulating such matters. Among the papers presented was one on the "Testing of Dry Gas Meters," by Mr. M. H. Stillman, of the Bureau of Standards, whose paper presented very briefly the problems involved in testing the ordinary dry gas meter and was divided into three parts:

1. Description of the ordinary type of dry gas meter.
2. Comparison of the meter with a calibrated meter or prover.
3. Comparison of the calibrated meter or prover with the standard cubic foot bottle.

Emphasis was laid upon the necessity of keeping the testing medium used in the comparisons, whether gas or air, at a very nearly constant temperature, pressure and relative humidity. Since the ordinary consumer's dry meter measures the *volume* of gas passing, the most direct and natural way to test this type of meter is to pass a *known* volume of gas or air through the meter and note whether the indicated volume corresponds. The present methods of accomplishing this consist generally in either:

A. Passing the testing medium (air or gas) through a standard meter and the meter under test in series.

B. Supplying the testing medium to the meter under test, from a meter prover.

In order to obtain correct results by either method, the following conditions are requisite:

When using a standard test meter, this meter shall correctly indicate the volune of gas passed through it.

When using a prover, the prover shall correctly indicate the volume of gas *delivered* by it.

When using either standard meter or meter prover there must be very little or no change in volume of the testing medium during its passage from the standard apparatus *to* and *through* the tested apparatus.

In order that the above three requirements be fulfilled:

1. The meter prover or test meter must be correctly calibrated.
2. The testing medium (air or gas) and every part of the system which might influence the temperature of the testing medium during the test, must be at the same temperature and remain at very nearly constant temperature during the tests.
3. The testing medium must not during the test absorb any vapors or other gases which may change its volume appreciably.

The errors due to the use of water as a displacing and sealing liquid were briefly discussed. The paper was illustrated with lantern slides and sample apparatus was shown.

THE STILL METHOD OF DIRECT RECOVERY OF AMMONIA.—In our reading columns will be found an illustrated description of a system for the direct recovery of ammonia from coal distillation products, which covers the device and method for such recovery recently patented in England, by Mr. Charles Still, of Recklinghausen, Germany. The system has seemingly the advantage over all of simplicity, a feature needless to say that will commend it. American gas engineers who may care to prosecute further research respecting it, may be interested to know that the Agents for the States are Messrs. Bagley, Mills & Co., of the Church street Terminal Building, New York.

CURRENT MENTION.—

MR. W. W. S. BUTLER has resigned the dual position of Vice-President and General Manager of the Western States Gas and Fuel Company, and Mr. Samuel Kahn has been appointed to succeed him. Mr. B. F. Wellington, Jr., formerly auditor of the Company, succeeds Mr. Kahn as Assistant Pacific Coast Manager. These properties are controlled by Messrs. H. M. Byllesby & Co.

IT is said that the organizers of the Parryville (Pa.) Gas Company propose to thoroughly pipe the Lehighton district of Pennsylvania.

MR. CHESTER C. DURKEE has been appointed Su perintendent of the Pueblo (Col.) gas plant.

JULY 15 has been named as the time for the special election to determine whether not the franchise of the Omaha (Neb.) Gas Company shall be extended for a period of 25 years, the Company to agree to establish a maximum selling rate of $1 per 1,000.

THE proprietors of the New Haven (Conn.) Gas Light Company have awarded to the Isbell-Porter Company, of Newark, N. J., a contract for the construction of a coal gas plant up to a daily production of 2,000,000 cubic feet. The carbonizing system is to be of the Woodall-Duckham type, and apparatus will be installed in a retort house, to be constructed on Chapel street, extending from the present structure to Mill river. The house will have the dimension of 105 feet in length, 75 feet in width and 70 feet in height. The understanding is that the house will be in readiness for operation some time during the winter of 1914.

"T. R. S.," writing from Boston under date of the 16th inst., says: "I failed to notice any mention in the JOURNAL of this date respecting the dinner annually tendered by Mr. James L. Richards, President of the Boston Consolidated Gas Company, to its heads of departments, and to those of the Middlesex & Boston Railway Company as well. The dinner, which was served in the large café on the grounds of the Norumbega Park Amusement Company, was altogether an informal affair and without any set speechmaking. Following the dinner, the party (numbering not far from 50), visited the open air theater in the park—this theater is said to be the largest of its type in the world—and were pleased witnesses of a lengthy and entertaining vaudeville programme. Special trolley cars carried the party back to the city, the dispersal being announced by a vollying of cheers to Mr. Richards that surely was resonant."

"THE final session of the Gas Service Club, of Quincy, Mass., for the current summer season, was held according to the announced programme. The members were the guests of the Company at a dinner well served in Thompson's Café, and then an adjournment was had to the Company's office, where Cashier John Muir read a well-prepared paper on 'The Relation of the Jobber to the Company.' When this had been discussed, the members attended the Kincaide Theater, and attended so vivaciously that they were soon on cross-fire acquaintance with some of the stage artists. The meetings, which will not be resumed until September, have resulted in good to both the Company and its men.—R."

SOME time ago "A Subscriber," from some unnamed place, wrote "I would thank you if you would publish in the next issue of your paper the method for calculating the flow of gas with a given size orifice, knowing the gas pressure." This question is so elementary that the answer thereto would not be worth the space that it would occupy. Further, if the information is worth asking for, the inquirer should give his name in any event; for anonymous communications are not in any sense considered available for a reply.

THE Employees' Association of the Flatbush branch of the Brooklyn Union Gas Company will have their annual excursion, the 6th prox. A steamer and barge have been chartered for the occasion, and the scene of the outing proper will be Islandwild Park. The parties in charge of the affair are Messrs. E. E. Glanz (Chairman), and H. Moran, F. Little, G. McGowan and W. Dumphey.

ON the 1st prox. the Marquette County (Mich.) Gas and Electric Company will remove to its commodious new business quarters in the Helonen block, Main street, Marquette. General Manager Harrington is arranging for a complete exposition of gas appliances; and the outfitting also includes a shop and testing room, located on the second floor of the building.

MR. ABNER T. JONES, who in 1908 entered the service of the St. Paul (Minn.) Gas Light Company as night foreman, and whose good work later on prompted the General Manager (Col. Paul Doty) and the Works' Superintendent (Mr. V. L. Elbert) to promote Mr. Jones to the responsible position of Assistant Superintendent, has been appointed Superintendent. In this post he succeeds Mr. Elbert, who, on the demise of Mr. Kerr Murray Mitchell, was elected to succeed the latter as General Manager of the St. Joseph (Mo.) Company. Here is a record which plainly proves that merit and application are sure of reward. Mr. Jones, in 1904, was, if we mistake not, a member of the field force of the Western Gas Construction Company, when that force was under the direction of Mr. A. B. Slater, from whence he went direct to Col. Doty's Company. All hail to you, "Super." Jones!

MR. JOHN GRISWOLD, a member of the Graduating Class, Madison (Wis.) University, 1313, with the ink scarcely dry on his graduating parchment, certifying to his preliminaries in the field of Mechanical Engineering, goes to Denver, Col., this week, there to assume a position on the engineering forces of the Denver Gas and Electric Light Company.

"OREGON," in a message from Albany, Ore., dated the 12th inst., says that the authorities of the named place have at last reached an agreement with Mr. F. L. Rauch, of Portland, and associates, whereunder the latter agree to construct and operate a gas plant in Albany for a term of 20 years, at the expiration of which period the city has the right to take over the property, the price thereof to be fixed under the usual arbitration method or plan. Under the terms, Rauch and associates further agree to file a written acceptance of the franchise on or before July 11th, and to file a bond in $5,000 that construction work shall be underway prior to January 1, 1914, and that the works shall be in operation on or before December 31st of that year. Certain capitalists of Detroit are said to be the main parties in interest.

"VOTER," writing from Albia, Ia., the 14th inst., says: "The special election, held this week in Albia, to determine whether or not Messrs. Lechband & Co., of Des Moines, Ia., should be allowed to construct and operate a gas works, was virtually unanimous. At any rate, for every vote opposed, 10 were in favor; and the contractors aver that the plant will be in readiness to operate by September 15th."

"MRS. J. H. MCMURRAY not long ago conducted a most successful demonstration, of how to use gas in the kitchen, for the Lincoln (Ills.) Gas Company, using an Acorn gas range to do the work. The demonstrations covered a 3-day period, and attracted very large audiences, many of the visitors being representatives of the best families in the city." So writes "Van.," under date of the 16th inst.

MR. S. G. RETUE has been appointed General Superintendent of the Northumberland County (Pa.) Pennsylvania Gas and Electric Company, with headquarters in Sunbury, Pa.

MR. CHAS. PFEFFER, who recently resigned the position of Manager to the York (Neb.) Gas and Electric Company, thus publicly noted his retirement: "On retiring from the management of the York Gas and Electric Company, I desire to thank the business men and the public for their goodwill and co-operation in the discharge of my duties. As Chairman of the Board of Directors, I will assist the management to give cordial treatment and best possible service to the people of York."

WE have had occasion to note prior to this that Mr. J. B. Harvey, of Aurora, succeeded Mr. Pfeffer at York.

THE Gas Machinery Company, of Cleveland, O., has been awarded contract to furnish new steel purifiers, of the outdoor type, on the plant of the Jacksonville (Fla.) Gas Company. The same contractor will also furnish new exhausting and condensing apparatus, retort house governor, etc. All of which means that the plant will be practically rebuilt save as to its generating and storage apparatus. New buildings will be constructed to house the machinery.

THE earnings of the Pacific Gas and Electric Company continue to show increases. For the 4 months, ended April 30th, the gross was $5,485,324, or an increase of $433,302; and the increase in net amounted to $100,460.

ON the 13th inst. Representative Conway, from a Boston (Mass.) legislative district, made strenous opposition to the measure which would prohibit wilful or fraudulent injury to gas meters. He claimed that, as proposed, a consumer would be prevented from making any change whatever in respect of the location of his meter, or to attach thereto a governor; further, that the penalty (in maximum, on conviction, such tamperer could be fined three times the cost of the injury done) was excessive. Mr. Sanborn (of Lawrence) also opposed the measure, contending that under its direction a consumer could be fined $100 for changing the location of his gas pipes, etc. Mr. Underhill (Somerville) said the measure was necessary mainly as applying to the conservation of public safeety. Owing to the lack of such legislation, through the acts of inexperienced gasfiitters in attaching "gas saving?" appliances, and the like, several fires had resulted and many persons had been asphyxiated. On motion of Mr. Curtin (Brookline) the bill was referred to the next General Court.

"B. P.," writing from Kenosha, Wis., under date of the 17th inst., says that the complaint made to the State Railroad Commission, by the authorities of Kenosha, asking that a revision of the rates charged by the Wisconsin Gas and Electric Company be ordered, will be considered the 2d prox. Our correspondent adds: "The wordy pyrotechnics of complainants may be counted on to 'boom and sizzle,' and perhaps fizzle, like the fireworks that will be set off in lovely Kenosha 2 days (or nights) later."

THE closing meeting for the season of the Philadelphia Section, Illuminating Engineering Society, was set for last Friday (20 inst.), at 6 P.M. The meeting place was the Engineers' Club, 1317 Spruce street, and while no particularly set number was on the technical programme, addresses by several prominent men in the Society were promised, and the installation of the officers for 1913–14 was also listed. The session was to be preceded by a dinner.

NEWS by way of Indianapolis is to the effect that Mr. Albert M. Schenck, President of the Packer Motor Truck Company, of Wheeling, W. Va., has devised a system of utilizing natural gas for the propulsion of motor vehicles. The account narrates that, in suitable cylinders, presumably of the type used by the New York Safety Car Heating and Lighting Company for storing Pintsch gas, he compresses natural gas to to the point of liquefaction. Each tank as now arranged holds about 600 cubic feet of "free gas" at a pressure of 50 pounds per square inch. The Scranton (Pa.) *Times*, which is our authority for this, notes that, "In application the tank is simply connected with the small expansion chamber to the ordinary carburetor, and the fuel admitted to the engine and used in precisely the same way that gasolene is used. Several cars have been fitted with the tanks, among these being two motor trucks, a Packard touring car, also a Ford. It is claimed that the cost of liquefying and storing is 5 cents per 1,000 cubic feet (it certainly cannot be any less), and that, from tests made on the Indianapolis (Ind.) Speedway, the Ford car was operated (on several trial runs) a distance of 100 miles at a use of 300 cubic feet. It is asserted that, under average conditions, the cost of operating a car with gas will be about ⅓ that of gasoline operation, the latter agent to be of .89 per cent., and costing 21 cents per gallon.

(*Continued from page* 403.)

RULE 10.—Subject to the approval of the Commission, each company may divide its distributing system into as many districts as it shall consider desirable, and it shall fix for each such district or for its distributing system as a whole, a normal pressure which it proposes to maintain. Gas shall be supplied at a pressure never varying by an amount more than 2 inches of water pressure above or below normal pressure thus fixed, as measured at the outlet of the campany's service pipe to any customer; provided, however, that the maximum pressure on any day at any such outlet, shall never exceed twice the minimum pressure on that day at that outlet; nor shall the pressure ever be less than 2 inches of water pressure at any such outlet. The normal pressure thus fixed by each company, and any proposed changes in these in these normal pressures, shall be reported to the Commission, and shall be approved by the Commission before going into effect.

Comments.—In order to care for cases where higher pressures are clearly to the advantage of all, or to allow special cases to be easily met, this rule is better than one setting an exact limit. In cases where differences of elevation make high pressure necessary in certain parts of a city, it would be especially convenient.

RULE 11.—Each utility furnishing gas service shall regularly take one or more continuous records of the gas pressure in each pressure district fixed under the provisions of Rule 10, and all these records shall be kept on file and open for public inspection.

Comments.—Practically all companies take at least one continuous gas pressure record, and they should do this for each district. In special cases the Commission should, perhaps, require more than 1 record in a large district, but this can be done under the above rule, which says "one or more." The gauges for taking these records should, of course, be moved from time to time to get full information as to pressure in the various parts of the main systems.

RULE 12.—Each utility furnishing gas service must furnish gas containing no more than 30 grains of total sulphur and not more than 5 grains of ammonia per 100 cubic feet, and containing not more than a trace of sulphur as hydrogen sulphide. Gas shall be considered not to contain more than a trace of hydrogen sulphide if a strip of white filter paper, moistened with a solution containing 6½ per cent. by weight of lead acetate, shows no darkening perceptible on comparison with a second paper freshly moistened with the same solution, after the first paper has been for 1 minute exposed to a stream of gas flowing at a rate of approximately 5 cubic feet per hour, the gas not impinging directly from a jet upon the test paper. Each company distributing gas shall daily test the gas leaving its holders for the presence of hydrogen sulphide, in the manner speci fied.

Comments.—The ammonia limit is desirable to make clear to all companies the practice expected of them. The fact that they will usually meet this limit even without specific statement in the rules, is not a satisfactory reason for omitting it. Since the rules are really a specification of the quality of service required, as such they should be complete. The limit will work no hardship in any case and in cases where careless operation permits excessive amounts of ammonia in the gas, the rule can be enforced. In order to define the term "trace," the method of test adopted by the Commission can be made clear in the rule. The form suggested is a simple definition which this Bureau would recommend. A daily test for hydrogen sulphide can be required with reason, and such specific rule may be advantageous. A requirement that all companies, or at least the larger ones, make determination of sulphur and ammonia in the gas, may also be desirable. For this purpose the following may be added to Rule 12 (the blank being filled with 50,000,000 or 100,000,000):

"Each company distributing more than ——— cubic feet of gas per year shall provide and maintain such apparatus as is necessary for the determination of the total sulphur and ammonia in the gas, and each such company shall regularly determine the amount of sulphur and ammonia in the gas distributed by it."

RULE 13.—Each company shall make a reasonable investigation of all complaints made to it by its customers, and shall keep a record of all complaints, showing the name and address of complainant, the nature of the complaint, with a statement of the method and date of settlement of the complaint. This record shall be kept open for pub. lic inspection.

Comments.—The specific statement that a reasonable investigation of complaints shall be made seems desirable, the investigation being such as is now required of Wisconsin companies. The Bureau is of the opinion that, in order to make a complete specification for gas service, the rules should prescribe a lower limit of open flame candle power for gas. The large number of consumers still utilizing a small portion of the gas used in open flame burners make it necessary that the open flame candle power of gas be maintained at least at a nominal value. To prescribe in the rules that such a gas must be delivered, seems reasonable, even though regular testing of candle power be unnecessary. In case the gas delivered is then not up to the standard in this particular, the rule gives basis for action to get good service.

Manager Ambler's Narrative of an Interesting Trip.

Last Monday Mr. T. M. Ambler entertained the members of the Progress Club (Brooklyn Union Gas Company) with the following interesting account of a series of visits recently made by him on an inspection tour of the commercial divisions of the Companies named:

After visiting various companies, as Mr. Chapple and I have just done, with no specific purpose except to get general information, it is a somewhat difficult task to write interestingly of what we have seen; but, in view of the liberality of Vice-President Stanniford in authorizing us to do so, we feel it is no more than right that we should attempt to share whatever we may have learned with those of you sufficiently interested to be present to-night. We visited Baltimore, Pittsburgh, St. Louis, Chicago, Detroit, Buffalo and Toronto, in the order named. In Baltimore we were particularly impressed by the manner in which we were received at the very door by an alert, wide awake and neatly attired young man, who greeted us with a pleasant smile, asking what he could do for us, and then turned us over to a boy, equally alert and polite, who piloted us several floors up to the office of their Commercial Manager, Mr. Dodson, where we were received very cordially.

Being interested in the matter of handling a warehouse, we spent the greater portion of the day trying to learn something about their methods of handling the various articles passing through that department. In this you are not particularly interested. Mr. Chapple declares that one of their most interesting processes was the application of gas-fired steam boilers to milk pasteurizing, and it is hoped we may be able to secure some installations here. He also saw some gas-fired coffee roasters in successful operation, that had been converted from coal. A spirit of co-operation and efficiency prevailed everywhere, always with the same courteous and pleasant smile, and with a willingness to answer questions and explain methods of procedure in detail. Simplicity and directness seemed to govern all their processes, and each different question seemed to have been given unusual attention; no ncessary detail being overlooked; all needless work being eliminated; and through it all the idea of service for their consumers predominated. We were presented with copies of their local publication, edited by the Gas Company and devoted exclusively to the gas business.

In Pittsburgh we devoted the entire day to an investigation of the Acme Refrigerating Machine, in which gas is burned, and which distributes ammonia through pipes to refrigerating boxes, in place of ice. We found that these machines were coming into pretty general use, and a large number of gas companies all over the country were very much interested in them. The Consolidated Gas Company, of New York, recently installed such a plant at Astoria for the large kitchen in which meals are prepared for their employees.

In St. Louis we found fully 90 per cent. of the hotels and restaurants using gas as a fuel in their kitchens, the hotel appliances being maintained by the Gas Company at a nominal charge per month. We failed to see one range or appliance not in the best of condition. A new type of hotel range is being built there which, it is claimed, will more nearly approach the coal range in the cost of operation than anything heretofore placed upon the market. We look forward to a report of the first tests of this range with considerable interest. They have also done more in house heating than in any other city, using all the known appliances, such as instantaneous hot water heaters, with special thermo controls; steam heating systems by means of a specially designed house heating boiler; and converting old hot air systems from coal to gas, in the latter gaining economy by passing the flue gases through a metal box in which are air tubes, through which the incoming air is preheated before reaching the furnace. They have also accomplished a great deal in both indoor and outdoor lighting. The Jefferson Hotel, one of the largest in the city, had about 25 or 30 outside lights extending across the entire front, and the effect was very pleasing. They made last year a large

installation of outdoor arcs in the bandstand of their principal public park, which had been hitherto lighted with electric arcs, and they expect to continue this lighting during the coming season, as the musicians stated it gave them the best illumination they had ever had. The Park Commissioners also had them install a gasolier of 19 inverted arcs in the dome of the park entrance.

In Chicago we were much impressed by the high character of the gas ranges on the display floor, some of which were priced as high as $220; and, what is more to the point, they told us that quite a few of these high priced ranges had been sold for use in large private residences.

Their investigations of the Rector system of house heating seemed to indicate that there are probabilities of successful operation of this device next winter. They also had on display a very unique outfit which they called their Chop Suey stove, which was especially designed for use in Chinese restaurants, and many of these had been sold.

Many of the gas furnaces on display were of their own design. The most striking one was a large oven furnace for tempering automobile springs, which was different from those hitherto made, in that the gas flames played directly on the rim, as in a gas forge. This has always been considered bad practice; but, in reality, it is ideal, no injury being done to the springs, and considerable savings in fuel and in time and operation being effected. We also saw a gas fired oven furnace, built on the down-draft principle, using the flue gases to preheat the incoming air from the blower. An actual test showed a saving of 19 per cent. in fuel. We enjoyed more than anything else the privilege of attending a meeting of the Company Section of the National Commercial Gas Association, at which nearly every department in the Company was represented, and in which the discussion was very general. The Superintendent of the Meter Department, in illustrating a point that he was trying to make, used a very novel idea which we are going to borrow, and which, we think, serves to emphasize this particular point as forcibly as it could possibly be done. You will notice two small rubber bags, both filled with gas, the one marked "P" being somewhat larger than the one marked "S." The "P" is intended to illustrate the matter of price, which, in every instance, is the obstacle to be overcome in trying to market any article or product. The "S" on the smaller bag stands for "Service," or, you might say, "Quality." These words amount to practically the same thing as far as the ultimate purchaser and the original price are concerned. Now the point it is intended to illustrate is this: The matter of price, of course, is the first obstacle to be met with in disposing of anything; but if the service rendered or the quality of the article is above the average, the matter of price gradually disappears and becomes of less and less consequence, until finally it is almost entirely forgotten.

In illustration of this point you will please notice that the bag marked "P" is becoming smaller and smaller, and the bag marked "S" is becoming correspondingly larger. This seemed to me a remarkably effective illustration which tends to prove that we should train ourselves to forget the price of the product we are trying to sell, and devote our entire attention, imagination, and personality to describing and emphasizing its value; and follow this up with "Service" in the best sense of the word, which means attention to details, politeness, thoughtfulness, forbearance, patience.

This reminds me of a phrase coined by Mr. E. C. Simmons, of St. Louis, head of the largest hardware concern in this country, which has been used as a slogan for a great many years: "Remembrance of the quality remains long after the price has been forgotten," and this seems an appropriate time to read a copy of a letter received by the Kane Boiler Company, from a customer of ours in Flatbush, who, during the past Winter, has used the Kane, gas-fired, steam boiler for heating a residence:

"In reply to your favor of June 3d, the gas consumed by your boiler for the whole winter is 577,800 feet, which, at 80 cents per 1,000, amounts to $462.24—a small fortune. Nevertheless, we are going to run it again next season—*D. V.* Every member of the household is so well pleased with the service we got from it, that I would not dare discontinue it. Besides doing away with all the ashes and dirt in the cellar, we were able to follow all the vagaries of our New York weather, and were never over 30 minutes behind any rapid change from moderate to extra cold, or *vice versa;* something we could never accomplish with the coal furnace."

In Detroit we had the privilege of visiting the plant of the Ford Motor Company, a concern that has used as much as 1,800,000 cubic feet of manufactured gas in one day, and whose average daily consumption is considerably above the 1 million mark. Gas is used for melting aluminum, for brazing, for forges, for magnet fires, enameling, soldering and annealing, and various other purposes too numerous to mention. This plant has turned out as many as 1,050 automobiles in one day, but the average is 800 automobiles per day, week-in and week-out, or at the rate of one complete automobile every 2 minutes. We were particularly interested in their large gas engines, one of 1,500-horse power, and two of 2,500-horse power each. Producer gas is being used in these engines at the present time, but we are informed that it is their intention, as soon as these two large engines are in working order (one of them is just being installed) to use approximately 28,000 cubic feet of artificial gas per hour for the purpose of enriching the producer gas. The Ford motor plant is particularly interesting because it seems to embody the very highest degree of efficiency practised anywhere in the world to-day; every piece of machinery being designed for some special purposes, and each individual being thoroughly trained to produce the maximum results out of his particular device. This plant is not only one of the most efficient in the world but is also one of the greatest money-makers of the present age, considering the short time in which it has been developed, and cannot but impress one with the possibilities in the ordinary human being, when developed under proper supervision. The American Car & Foundry Company, one of the largest manufacturers of cars in the country, uses gas-fired forges for heating rivets, and it was quite interesting to see the effective work done. They have a large number of these furnaces and watch them very closely, it requiring almost the entire attention of one man to see that the proper flame is maintained, so that gas is not wasted. They express themselves as being very well satisfied with the results obtained, especially owing to the ability to eliminate the cost of operation as soon as the plant is closed, or when the work is slack. The day we were there only a few of their furnaces were in operation, as only a few cars were going through the shops, due to some trouble with their machinery.

Arriving in Buffalo, the morning of Decoration Day, we immediately proceeded to Toronto, as, of course, our English cousins do not observe this as a holiday. We were very much interested in what we saw there and rather pleased to find a native born American in charge of the New Business Department. In the face of very keen competition from hydroelectric plants, the Gas Company seems to hold its own in the lighting field, having a great many Humpbrey gas arc lamps in various large stores in the city. They also sell a large number of stoves and ranges, but are not as liberal in their terms as we are, asking ¼ down and the other ¾ within the next 90 days; in other words, all accounts are closed within 4 months from date of installation. The Secretary of the Company informed us that they were putting into operation a system of accounting, which enabled one clerk to handle about 6,300 accounts, and that after they had perfected it a little further, he felt sure they could handle from 7,500 to 8,000 accounts with one clerk. Owing to the limited time, and the fact that we had to leave shortly after noon on Saturday, we were unable to get more details in regard to this system of accounting, but it certainly is a rather surprising accomplishment, regarding which we will probably secure more complete details a little later.

Upon our return to Buffalo we were met by Mr. Lucius Bigelow, of "The Gas Industry," who took us out to his house and showed us a new clothes-drying device, which is apparently quite efficient, and which we hope to be able to make use of here.

We were absent from Brooklyn 10 days and 11 nights, 6 of the latter being spent in sleepers, 4 in hotels, and 1 on the lake steamer from Detroit to Buffalo; so you can readily see that, while we enjoyed this trip greatly, we were fully occupied, and are sure we have gained enough general information to justify it. I trust you will not misunderstand me when I ask if the Progress Club is fully carrying out the purposes of its organization, and if it is not possible for us to broaden our lines during the coming season, and devote more of our time and attention to development along educational lines. The Club, during the past winter, has increased its membership largely. It has also enjoyed several very successful entertainments, but comparatively little attention has been paid to the real, as I understand it, objects of the organization. Increased membership brings increased revenue, and also is apt to increase our desire for amusements, and while I do not desire, and have no intention to criticise, the gentlemen at the head of the Entertainment Committee (because their work is beyond criticism) at the same time I believe that the Club, as a whole, should take stock of itself and give due considera-

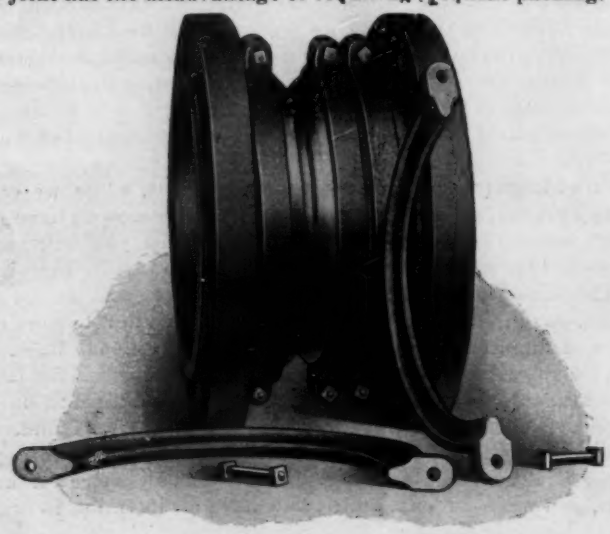
tion to the best methods for securing good results from the dues received, and, to a certain extent, subordinate the entertainment feature, and increase the mental development of its members, especially as in many cases the entertainments are revenue producers.

Might it not be well to organize a local section of the National Commercial Gas Association. It would not in any way interfere with the Progress Club, but would give employees, who do not care to pay $3 a year dues, an opportunity of belonging to an organization for mutual benefit, that would not require any dues, and that would confine its papers to members only, and thus develop latent talent among the employees of this Company, while the Progress Club could, by securing men of broader experience to lecture, increase development on more liberal lines. The Peoples Company, of Chicago, have an Advance Club, conducted on lines somewhat similar to our Progress Club, and, in addition, have a local section of the National Commercial Gas Association with about 200 members.

All now belonging to the National Commercial Gas Association are eligible as Class "A" members, and all other employees of the Company are eligible as Class "B" members. The officers and directors in this section will be confined to Class "A" members, Class "B" members not being eligible. As this Company holds a membership in the National Commercial Gas Association, any employee of the Company can be admitted to the National Association without the payment of the usual initiation fee of $5. All desiring to join the National Association, after the 1st of July, will only have to pay $2.50, first 6 months' dues, in order to become full members of the National Association. Any member who will take the National Commercial Gas Association course during the coming winter, paying $5 for it, and completes the course prior to the 1st of July, 1914, will be refunded the $2.50 initiation fee and the $5 school fee, by the Company, and be continued as a member of the National Commercial Gas Association, without further annual dues, as long as he remains in the employ of this Company. We should like very much to be able to form a large Class during the coming winter, and believe, by working together in this manner, that all of us would receive great benefit.

New Methods and Appliances.

THE BADGER SELF-EQUALIZING EXPANSION JOINT.—The Badger Self-Equalizing Expansion Joint is a corrugated copper joint with external rings, designed to take up changes of length in pipe lines, conveying steam, water or oil. Every engineer has had experience with the irresistible strains in pipe lines, set up by expansion and contraction. Loose, leaky fittings, and perhaps here and there a fractured joint, point conclusively to the necessity for some device having sufficient flexibility to absorb these changes in length. The amount of change in length depends upon two factors, the length of the pipe and the difference in temperature. Although old-fashioned bends and long sweeps and loops are useful in making changes in direction, and have been used quite extensively for taking care of changes in length, they are not beautiful and they take up considerable space; also cracks are liable to develop under repeated temperature changes. A slip joint has the disadvantage of requiring frequent packing.



The Badger joint combines elasticity to stand repeated changes of shape, with strength to resist any pressure for which the joint is designed. The well-known corrugated form, such as is used for internally fired furnaces of marine boilers, is adopted because of its strength and flexibility. But a single piece of copper would have to be very thick for high pressures, and in practice it is found that there is always a tendency for one or two of the corrugations to take the entire strain of change in shape. Those few corrugations, taking all the work, would give out in time. External rings on the corrugations of the Badger joint distribute these strains among several of the corrugations and by thus bringing more into service, no one of them is called upon to take more than its share of the work. The external rings transmit a part of the strain to the next corrugation and as each corrugation moves but slightly, the joint lasts almost indefinitely. The external rings give added strength to the joint in the same way that the spiral winding of a pipe with wire adds to its strength. The number of corrugations depend upon the pressure and the length of the joint. For high pressures and superheated steam, the change in length is considerable, therefore more corrugations are used. For very low pressures, as in exhaust piping, two or three corrugations are sufficient for the slight alteration in length. In some cases where the expansion is little, but vibration must be taken care of, the joint does not need any external rings, but external rings are generally used to add strength for high pressure, or to stiffen exhaust pipes against collapse.

The Badger Expansion Joint is made in a complete line of sizes, for all pressures, and with flanges drilled to A. S. M. E. standards. These joints require no packing and take up no more room than the pipe in diameter and have been made oval, rectangular, and in other special shapes.

A NEW METER IN CONNECTION WITH MECHANICAL PURPOSES.—The American Meter Company recently designed and perfected a meter which shuts off the gas instantly and automatically when there is any tendency for the gas to work backward through the measurer. This meter was gotten out to the order of the Brookly Union Gas Company, and is located in the United States Navy Yard, Brooklyn, N. Y. Since air under pressure has been used so extensively, in connection with gas for so many and varied mechanical purposes, it has occasionally happened that the air worked back into the meter, sometimes causing explosions with serious results. The meter which the American Meter Company has just gotten out positively overcomes the trouble referred to.

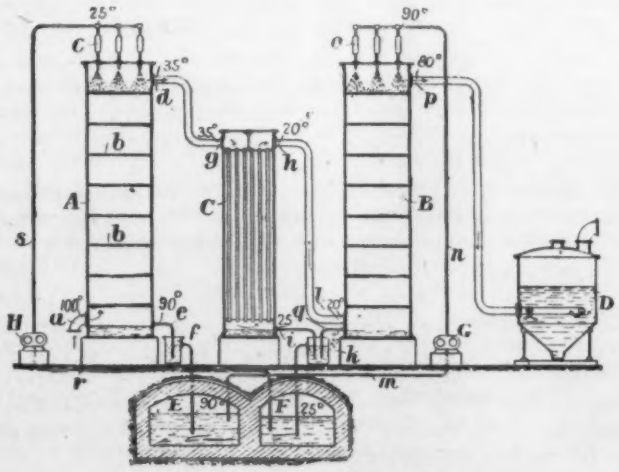
STILL'S DIRECT RECOVERY OF AMMONIA FROM COAL DISTILLATION PRODUCTS.—An English patent has been issued to Herr C. Still, of Recklinghausen, Germany, concerning methods thus described:

The direct process for recovering ammonia from the products of the destructive distillation of coal consists in removing the tar from the products, and passing the gases through an acid bath to convert the ammonia into a fixed salt. The usual method of carrying out this process consists in cooling the hot crude gases to atmospheric temperature in tubular condensers to remove the tar; and then conducting the gas through an acid bath wherein the ammonia is separated. The objections to this method are that the cooling of the gases in tubular condensers, that is, cooling indirectly, necessitates installations of large dimensions; and that, during the process of cooling, large quantities of water of condensation containing ammonia are produced, which must be treated by steam and lime in special apparatus in order to recover this ammonia. It follows that this method, as contrasted with the older method of washing out the whole of the ammonia by water and then distilling it, is only a partial success and a slight improvement.

The troublesome process of cooling the gases can be avoided by cooling by means of water injected directly into the gas and brought into intimate contact with them. This direct cooling is very efficient, and requires cooling apparatus of smaller size. If done by causing the gases to meet water travelling in the opposite direction, the gases can be cooled nearly to the initial temperature of the injected water, while the outflowing water is heated nearly to the temperature of the incoming hot gas, and takes out more of the tar than by cooling in tubular condensers.

When the gases are cooled by water brought into direct contact with them, water and ammonia are separated from the gases, as in the indirect cooling, the two materials mixing with the cooling water. The ammonia and water thus separated can be again introduced into the gases, now free from tar, by causing the hot water to travel through the cooled gases in the second stage of the procedure, in exactly the same manner as in the first stage, where the gases were treated by water for direct cooling. By means of this second treatment the gases can be heated nearly to the temperature of the injected hot water, and the water will be cooled nearly to the temperature of the incoming cold gases. In the present invention the two processes of direct cooling and the subsequent re-heating, are combined; the same body of water is used in circulation, and the gases subjected to a special intermediate cooling between the two stages The temperature of the gases under treatment is, towards the end of the first stage (the direct cooling), somewhat above that of the water coming in; and at the subsequent beginning of the second stage (the direct re-heating) somewhat below that of the water leaving there. Now, by reducing the temperature of the gases between these two points, the temperature of the two waters may be the same, and consequently the cold water running from the heating apparatus can be used immediately afterwards as cooling medium in the direct acting condenser. By this arrangement, "a complete continuous circulation of the water within the whole system may be maintained; the water being used alternately for direct cooling and direct heating of the gases treated."

The illustration is a diagrammatic vertical section through the plant.



Still's Ammonia Recovery Plant.

A is the column in which the crude gases are cooled; *B*, the column in which the cooled gases are re heated; *C*, the heat interchanger; and *D*, the saturator, in which the ammonia is absorbed by acid. The wells *E* and *F* collect the liquors for the columns *A* and *B*, respectively, and *G* and *H* pump these liquors to the columns in which they are used. The temperatures marked relate to the gases and water flowing at those places, and serve to illustrate the principle involved.

An exhauster (not shown) draws the hot crude gases into the column *A* at *a*. The gases flow upwards, in the opposite direction to the cooling liquor, which is pumped by H through pipes *r s* from *F* to the top of the column, where it flows through sprays *c* and is distributed in the column by perforated partitions *b*. Suppose the temperature of the gases entering at *a* to be 100° C., and that of the cooling liquor entering at the sprays 25° C. The cooled gases leave the column at *d* at a temperature higher than that of the entering liquor, say 35° C.; and the heated liquor flowing from the bottom of the column leaves at a temperature lower than that of the entering gases —say, 90° C. In cooling the gases the whole of the tar and a quantity of the water contained in the crude gases are condensed and mix with the cooling water. This liquor flows through a seal pot, *f*, into the well *E*, where the tar separates. The gases pass from *d* and enter at *g* the heat interchanger *C*, which is a tubular condenser, wherein the water flows around the tubes. This is to cool the gases to about atmospheric temperature; that is, from about 35° C. to about 20° C. This cooling entails the condensation of a small quantity of liquor which flows into the seal pot *k* at an average temperature of 25° C. The cooled gases pass from the heat interchanger, *C*, at *h* into the heating column, *B*, at *l*. This column is of similar construction to *A*, but its function is of an opposite nature—the cooled gases being re-heated by the hot liquor pumped from the well *E* through the pipes *m n* to the sprays *o* at the top of the column. In this column the gases, in being heated, take up a quantity of water sufficient to saturate the gases issuing at *p*. The temperature of the gases at this point may be about 80° C.; and they contain practically all the ammonia in the original crude gases, and deliver it to the acid in the saturator *D*. The liquor, leaving the bottom of the column *B* at a temperature of 25°, flows through pipe *q* and the seal pot *k* into the well *F*, with the condensed liquor from the heat interchanger. From the reservoir the liquor is pumped to the column *A*.

In order that the apparatus may work satisfactorily, it is important that the gases entering column *A* should contain as much heat as possible. This can be assured by covering the gas pipes; but a feature of the invention is to increase the heat capacity of the crude gases by increasing the proportion of aqueous vapor carried by them in the following manner: A portion of the liquor collected in the well *E* is pumped into the hydraulic main, where it is evaporated by the heat of the hot crude gases. This evaporation lowers the temperature of the gases, but the heat is carried by the aqueous vapor passing into the gases and is re-converted into sensible heat in the water used in circulation, by condensation of the vapor in the column *A*.

Homemade Week at La Crosse, Wis.—Homemade Week was celebrated at La Crosse, Wis., from May 25 to 31. The merchants gave up their show windows to the manufacturers, nearly 100 of whom took advantage of the opportunity to cause their goods to become better known locally. Really the most prominent display was that made by the La Crosse Gas and Electric Company, which superior effect was largely due to the illumination. The Company secured a corner building for its display and placed 15 Humphrey 3-mantle, gas arcs around the roof of the structure. The outcome was favorably commented upon by both press and public. The illustration gives a very good idea of the arrangement. The window

display consisted of the reproduction of an "electric dining room," and a gas kitchen. The various things shown, numbered Clark

Jewell ranges, Humphrey geysers, Vulcan irons, General Electric appliances, Sturtevant vacuum cleaners and Equalite glassware. Manager Thurston Owens was and is very enthusiastic over this exhibit, and he will be more than pleased to furnish further information to anyone interested.

GAS LIGHT PHOTOGRAPHY.—The Central Indiana *Gas News*, published by the Central Indiana Gas Company, shows this illustration

of a gas lighted studio, and gives some interesting information respecting such installations. Photography by gas light -not only the work of the camera itself, but the printing of the picture—will be one of the most interesting demonstrations ever attempted by the Photographers' Association of America, at their annual convention in Kansas City. It is proposed to have one large gas lighted studio under the direction of men capable of demonstrating the extraordinary advantages of gas light for all the processes of photography.

AN ODD ENGLISH PLAN FOR STOPPING LEAKS IN GAS PIPES.—An English patent has been granted covering the stopping of leaks in gas pipes, by floating a cementing material into the crack or hole, from inside the pipe. The specifications say in part:

"Frequently it has been found that the exposing of the pipe at the damaged points was the only safe method to get at the leak. This exposing is, however, often impossible without very considerable damage to the building. Other methods for the repair of leaks have hardly been known; and it may be concluded that they have not proved successful. According to the present process this trouble is remedied * * * by filling the gas pipe completely with a special liquid, allowing the latter to run off again after a while. The liquid is composed of a solution of shellac, rosin, or similar materials, in spirit. In other words, a kind of varnish, which has been found to have the property of penetrating into all leaking spots of the gas pipe and of leaving there, after the evaporation of the spirit, a closing layer. This action appears reasonable without further explanation, when it is borne in mind that the materials employed for the solution —such as shellac, rosin and the like – possess for the purpose in view specially favorable properties. These substances deposit completely in the holes and splits of the pipe firmly and, therefore, assures a permanent calking thereof."

Recent Patent Issues.

Prepared for the AMERICAN GAS LIGHT JOURNAL by ROYAL E. BURNHAM, solicitor of patents and counselor in patent causes, 833 Bond Building, Washington, D. C., from whom illustrations and specifications of any patent mentioned below may be obtained for 20 cents.

1,062,163. Manufacture of Inverted Mantles. E. L. Knoedler, Gloucester City, N. J., assignor to Welsbach Light Company, same place.
1,062,178. Automatic Gas Valve. E. E. Miller, Valley View, Pa.
1,062,268. Gas Meter. J. R. Armstrong, Pittsburgh, Pa., assignor of one-third to W. H. Irvin, same place.
1,062,301. Gas Generator. C. Rosanz, New York City.
1,062,179. Gas Valve. E. E. Miller, Valley View, Pa.
1,062,445. Gas Cleaner. A. Ernst, Pittsburgh, Pa.
1,062,446. Gas Cleaner. A. Ernst, Pittsburgh, Pa.

Items of Interest
FROM VARIOUS LOCALITIES.

THIS is the way it looked to Judge King, when passing sentence on John J. Johnson, convicted of having robbed coin prepayment meters in the Bixby apartment house, North Main street, Brockton, Mass.: "I decree that you shall be committed to the House of Correction for the period of one year. Your crime is 'next door' to stealing from the alms box in a church."

THE gas suppliers of Reading, Mass., have retained Miss Shirley Martin, a graduate of the Boston School of Domestic Science, to demonstrate the value of gas cooking from a satisfactory, hygienic and economic point of view. She will also straighten out the tangled complaints of those who, having domestic gas appliances, do not know how to use these knowledgeably.

"B. V. R.," writing from North Yakima, Wash, under date of June 5th says: "Under the direction of the Department of Physics, University of Washington, there has been established a Bureau of Testing, which has been appealed to, in the last two or three years, by many of the gas and electric users in the city. Gas, electric and water meters have been tested in large numbers; and the testings are further invoked to determine the lighting values of lamps of all sorts. In fact, the electric lighting plants in Tacoma and Seattle are frequent availers of the opportunity thus afforded to determine whether or not the lamps they purchase are up to specifications. The department is under the altogether satisfactory supervision of Dr. F. A. Osborn."

THE commercial force of the Central Hudson Gas and Electric Company recently listened to a very useful and well-delivered address on the use of modern lamps and fixtures in an up-to-date manner. The lecturer was Mr. Frank Carpenter, of the New York city division of the Welsbach Light Company, and the audience room was in the Central Company's Poughkeepsie offices.

CONSTRUCTION work is underway on the 16 inch main with which the Westchester Lighting Company proposes to hook up the settlements of Tarrytown and White Plains, N. Y., also supplying Elmsford and intervening points along the route. This will cost, all told, not far from $150,000.

THE many friends of Mr. W. J. Bowen, a well-known member of the engineering force of the Pacific Gas and Electric Company, will regret to hear, that he, while riding in a buggy along the lines of the Company near Sheridan, Cal., was thrown therefrom, the horse that was hauling the trap having taken fright and bolted. He is suffering from a fractured skull.

MR. L. W. PRICE informs us that the Tacoma (Wash.) Gas Company, on the 1st prox., will discontinue the sale of gas appliances. The work of going on with the trading will be taken up by Mr. P. J. Dielman, who since 1909 has been in charge of the Company's commercial division. He has formed the Gas Consumers' Supply Company, and associated with him are Messrs. Henry Kidd and A. M. Hawley. Mr. Price also remarks that the new concern has been fortunate enough to secure the exclusive agency for the sale (on wholesale account) of Detroit Jewel gas ranges for Washington, Oregon and British Columbia. There is little doubt that Mr. Dielman and his associates will make a go of their venture, for all three are of the type who, in imparting information to customers, present and prospective, are able to do so without assuming lordly manners and without making know-it-all declarations.

"B. B.," writing from Freeport, Ills., under date of the 12 inst., says that Mr. E. D. V. Dickey, formerly of Beloit, Wis., took charge at Freeport on the 1st inst., with the title of General Manager. Mr. Dickey came to Beloit about a year ago, from Emporia, Kas. He succeeds Mr. C. W. Butterworth, who has been named to take charge of the distribution division at Freeport.

MR. C. W. DANIELS, as a sort of curtain raiser to the gas cooking demonstration in Portland, Me., which was conducted some time ago for the Portland Gas Light Company, by Miss Jessie Loveridge, in Pythian Temple, delivered a well thought out address on "How to Burn Gas Economically."

THE Western United Gas and Electric Company will erect an eight-story office structure, on Fox street, Aurora, Ills., that, when completed, will be the finest business headquarters in that busy Illinois city. The building will have a frontage of 66 feet on Fox street, running to a depth of 157½ feet. It will occupy half the street floor space, and the second floor will be used as offices, etc., for its own use. The other floors will be rented for general business utilities.

THE Northern Central Holding Company, which is under the direction of Messrs. H. D. Walbridge & Co., of this city, has acquired control of the Northumberland Gas and Electric, the Northern Central Gas, and the Columbia and Montour Electric Companies. The Pennsylvania settlements served by this aggregation: Williamsport, Milton, Watsontown, Berwick, Bloomsburg, Danville, Sunbury, Northumberland, Selinsgrove and Lewisburg. The Company will make some important changes in the commercial system of the named properties.

THE Directors of the American Public Utilities Company have declared these regular quarterly dividends, payable the 1st prox.: Preferred, 1¼ per cent.; common, 1 per cent.

"S. P. V.," writing from Key West, Fla., under date of the 13th inst., says: "The writer has noted, with a good deal of interest. that various tennis courts, and lately a golf course, have been satisfactorily lighted by means of gas, so that the named games can be engaged in at night. Hence it may be of interest to the gas fraternity to know that the Key West Gas Company has lighted up a basket-ball court, with Humphrey arcs, and the plan is giving complete satisfaction.

"W. G.," in a line or two from Pawtucket, R. I., dated the 13th inst., forwards this comment from a local newspaper, the Editors of which are of the rare sort who can find something creditable in the publication of matter that reflects commendation on the work of a public utility concern: "Your Committee (Pawtucket Board of Trade), after thoroughly discussing the lighting question in all its bearings, and having examined the various printed reports of States and cities, as well as holding frequent interviews with the officials of the Blackstone Valley Gas and Electric Company, begs leave to report that it believes the rates charged for electric lighting and power in the city of Pawtucket, when compared with other cities, are reasonably low.

"We congratulate the Company upon the frankness and fairness with which our requests have been met, and are confident that this reduction in price and improvements in service, which they have both been making, will prove of great benefit, both to the Company and the public, in popularizing the use of electricity. Comparison with the surrounding cities has been made with this city, and is about as follows: We consider Boston first. Though many times larger than Pawtucket, and having many more consumers, the price of electricity is 10 cents, net. Every customer, numbering nearly 50,000, has been mailed personal letters asking for complaints or suggestions respecting this service. Of recent years many cities of moderate size have made efforts to increase and improve the lighting of their streets, by adding to the number of lamps and raising the illuminating value thereof, especially in respect of the business centers, so that the people who are in the mills during the day, and the travellers who may be passing through the cities, will be attracted to, acquainted with, and interested in the business of Pawtucket. This nature of work has been started and kept up by the business associations and the municipality, working jointly.

"Many cities have railroad depots that are attractive, or squares which enhance the beauty of the settlement; but Pawtucket, which is a live business place, with every foot along Main and Broad streets used to its limit, needs more electric lights to attract people to its streets. This city, which is such a thoroughfare for motorists going from Massachusetts to Rhode Island, places such as Providence, Narragansett Pier, Watch Hill, etc., and a trading center for the towns North, to the State line and the Attleboros, should provide bright streets, so that Pawtucket, will not be known as 'next to Providence,' but a city which stands on its own feet, due largely to its 'White Way.'"

"D. K. T.," writing from Harrisburg, under date of the 12th inst., informs us that, at a meeting of the Trustees of the Shenandoah (Pa.) Citizens Water and Gas Company, held June 2, 1913, the following minutes to the memory of its late President (Mr. Thomas R. Beddall) were adopted:

Whereas, It has pleased an all-wise Providence to take out of this world, and from the scenes of his activity, our esteemed President, Mr. Thomas R. Beddall.

Whereas, In view of the loss we have sustained, and the still greater loss sustained by those who were nearest and dearest to him, therefore, be it

Resolved, That it is but a just tribute to the memory of the departed to say that, in regretting his removal from our midst, we mourn for one who was in every way worthy of our respect and regard as a man and as a official.

Resolved, That we sincerely condole with the family of the deceased in the dispensation with which it has pleased Divine Providence to afflict them and commend them for consolation to Him who orders all things for the best, and whose seeming chastisements are the forerunners of greater reward.—DR. S. M. KISTLER, JOHN DUNLAP, THOS. TOSH.

THE voters of Lebanon, O., by virtue of a special election, held some days ago, have determined to operate a gas plant on municipal account. A bond issue is provided for, the proceeds of the sale of the securities to go to the purchasing of the plant of the Lebanon Gas Company, and to equip the same for practical working. It certainly need "re-equipping."

GENERAL MORRIS SCHAFF, of the Massach usetts Board of Gas and Electric Light Commissioners, has been appointed President of the Association of Graduates, West Point (N. Y.) Military Academy.

PRESIDENT FREDERICK P. ROYCE, Boston; Vice President W. G. Bushnell, New Haven; and Samuel C. Morehouse, representing the Connecticut Power Company, appeared before the authorities of New London, Conn., to combat a petition asking for lower gas rates in the named place. The main contention in opposition was that the increase in the price which the Company had to pay for oil (in 1912 the rate was 4½ cents per gallon; in 1913, the rate is 6⅘ per gallon), which adds 10 cents per 1,000 to the cost of manufacture, rendered any reduction impossible. In fact, it was urged that the increase cost of oil would readily justify a petition on the part of the Company for the right to increase the selling rate. This stand on the part of the Connecticut Power Company (this corporation controls a dozen or more gas and electrical properties in the Western section of the State) is praiseworthy, for it certainly looks that, for the time at least, or until the freight carriers manage, possibly by and through the assistance of the Panama Canal, to put oil in the far East from the far West at a rate that will approach to or approximate the rate in vogue in this section say 3 years ago.

MR. CHAS. W. MORSE, of Haverhill, Mass., died in Gainesville, Fla., the morning of the 11th inst. He had visited Gainesville in the hope of regaining his health. Mr. Morse at one time owned the gas plants at Marlboro and Quincy, Mass., and had a large share in the gas and electric properties in Rochester, N. H., Amesbury and Salisbury, Mass., and Gainesville, Fla. He was born in Haverhill, Mass., April 26, 1851, graduated from the Haverhill High School in 1869, and entered the employment of the Haverhill Aqueduct Company in 1870. He advanced himself steadily in its service, finally becoming its Superintendent and General Manager, which position he held until the municipality took over the property about 1883. He then went West to engage in a mining operation, but eventually returned to the East, where he engaged in the artificial lighting business as aforesaid, His widow survives, also a daughter. The remains were brought to Haverhill for interment in his native city.

"B. V. B.," thus writes from Brockton, Mass., under date of the 13th inst.: "The annual meeting of the Employees Association of the Brockton Gas Light Company was held last Monday; and let me say it was a fine session. A question-box was used for the first time, and its contents were such as to provoke several discussions. Messrs. James Moran and Charles Chamberlain were placed on the Honorary Membership list, this award being made because both had been in the service of the Company for over 25 years. The officers elected were: President, James P. Moran; Vice-President, John Sheehan; Treasurer, William Morton; Secretary, George C. Kane. The Company's Superintendent (Mr. H. K. Morrison) was re-elected Chairman, Executive Committee. Mr. Morrison made a very clever address, in which he congratulated the members on the fraternal spirit that was evident in all the doings of the Society, and hoped that the next year would be productive of still greater good to them all. A committee of 5 was appointed to arrange for a day's outing. The business meeting at an end, festivities were in order. The main features of the occasion were: A tenor solo, by Mr. E. P. Neafsey; a recitation, by Chief Inspector Bush; a violin selection, by Mr. James Moran; a piano solo, by Mr. John Wise; and a baritone solo, by Mr. William Morton. Take it all-in-all the Society's aims have been well kept and fostered."

The Market FOR GAS SECURITIES.

Now that the Japanese teapot exhibition has cooled to a simmer, that the chief importing houses still have their front doors open, and that even ex-Recorder Goff may have been over-virtuous in ex-Chamberlain Hyde's case, and that money "on call" is "fairly easy" at 2½ per cent., Consolidated gas has kept up its average price record. That is, it opened to-day (Friday) at 129½ to 130, and there was quite some inquiry for it; as well there should be. The Mutual Company's Directors this week declared an interim (semi-annual dividend, of 5 per cent., payable the 5th prox. Books close June 26th. This payment corresponds to the one declared the first half of 1912; the payment for the last half of 1912 was 4 per cent.

The out-of-town market is extremely dull, although some inquiry was in evidence respecting Peoples, of Chicago. The dividend on Georgetown (D. C.), which is the first for some time, rather shows the economies that may be developed by good engineering. Beyond a doubt Mr. Holden is the right man in the right place, in that he has no desire to antagonize anyone, while performing his duties oo the job. The Massachusetts Lighting Company has declared a regular quarterly dividend of 1¼, payable the 15th prox. Messrs. Henry L. Doherty & Co., are issuing a balance of $2,000,000, 7 per cent. convertible coupon notes, in denominations of $100, $500 and $1.000, dated May 15. These are offered at par and accrued interest, 7 per cent. base, and are redeemable at any time within 5 years, on 30 days' notice, at 102 and interest. Further the holder may convert these at any time into the preferred stock of the Cities Service Company. This offering looks to us a prime short period investment.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

115 BROADWAY, NEW YORK CITY.

JUNE 23.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par alue of $100 per share:

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked*
Consolidated Gas Co.	$99,816,500	100	129¼	129⅝
Central Union Gas Co.—				
1st 5's, due 1927, J. & J.	3,500,000	1,000	101	103
Equitable Gas Light Co.—				
Con. 5's, due 1932, M. & S.	1,000,000	1,000	105	106
Mutual Gas Co.	3,600,000	100	157	157
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	99	101
New York & Richmond Gas				
Co. (Staten Island)	1,500,000	100	59	62
1st Mtg. Gold Bds. 5 p. ct.	1,500,000	—	98½	100½
New York and East River—				
1st 5's, due 1944, J. & J.	3,500,000	1,000	103	105
Con. 5's, due 1945, J. & J.	1,500,000	—	96	100
Northern Union—				
1st 5's, due 1927, J. & J.	1,250,000	1,000	100	102
Standard	5,000,000	100	102	104
Preferred	5,000,000	100	90	100
1st Mtg. 5's, due 1930, M. & N.	1,500,000	1,000	103	105
The Brooklyn Union	15,000,000	1,000	125	130
1st Con. 5's, due 1948, M. & N.	15,000,000	—	106¾	107
Yonkers	299,650	500	120	—
Out-of-Town Companies.				
Binghampton Gas Works	450,000	100	—	—
" 1st Mtg. 5's	509,000	1,000	97	100
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	5	6
Bonds, 5's	3,250,000	1,000	59	60
Capital, Sacramento	500,000	50	—	35
Bonds (6's)	150,000	1,000	—	—
Chicago Gas Co. Guaranteed				
Gold Bonds	7,000,000	1,000	104	106½
Cincinnati Gas and Electric				
Co.	29,500,000	100	87	90
Essex and Hudson Gas Co.	6,500,000	—	133	136
Fort Wayne	3,000,000	—	—	—
" Bonds	2,000,000	—	55	—
Grand Rapids Gas Light Co.,				
1st Mtg. 5's	1,350,000	1,000	100	101
Hartford	750,000	25	190	200
Hudson County Gas Co., of				
New Jersey	10,500,000	—	130	133
" Bonds, 5's	10,500,000	—	104	106
Indianapolis	2,000,000	—	7	80
" Bonds, 5's	2,650,000	—	20	93
Jackson Gas Co.	250,000	50	82	—
" 1st Mtg. 5's	290,000	1,000	97	100
Kansas City Gas Light Co.,				
of Missouri	5,000,000	100	—	86
Bonds, 1st 5's	3,822,000	1,000	98½	99
Laclede Gas Co., St. Louis.	10,000,000	100	92½	10
Preferred	2,500,000	100	99	102
Bonds	10,000,000	1,000	102½	103
Lafayette Gas Co., Ind.	1,000,000	100	—	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	120	120
Madison Gas and Electric Co.				
" 1st Mtg. 6's	400,000	1,000	106	
Massachusetts Gas Companies, of Boston	25,000,000	100	90¼	90¾
Preferred	25,000,000	100	86	86¼
Montreal L. H.& P., Canada	9,000,000	100	210¾	211¼
Nashville Gas Light Co.	1,000,000	100	110	—
Newark, N. J., Con. Gas Co.	6,000,000	—	97	98
Bonds, 6's	6,000,000	—	127	128
New Haven Gas Co.	5,000,000	25	182	190
Peoples Gas Lt. & Coke Co.,				
Chicago	25,000,000	100	107¾	108¾
1st Mortgage	20,100,000	1,000	102	102½
2d "	2,500,000	1,000	104	—
Rochester Gas & Electric Co.	2,150,000	50	88	—
Preferred	2,150,000	50	118	—
Consolidated 5's	2,000,000	—	104¾	105½
Pacific Gas and Electric Co.	15,500,000	—	40½	41
St. Joseph Gas Co.—				
1st Mtg. 5's	1,000,000	1,000	96	98
St. Paul Gas Light Co.	2,500,000	100	—	—
1st Mortgages, 6's	650,000	1,000	104	105
Extension, 6's	600,000	1,000	112¾	115
General Mortgage, 5's	3,447,000	1,000	94	96
Syracuse Gas Co., N. Y.	1,975,000	100	50	55
Bonds	2,047,000	1,000	101	103
Washington (D. C.) Gas Co.	1,600,000	200	417½	420
1st Mortgage, 6's	600,000	—	—	—
Western Gas Co., Milwaukee	4,000,000	—	—	—
Wilmington (Del.) Gas Co.	600,000	50	—	—

MEETING TIMES OF THE VARIOUS GAS ASSOCIATIONS.

American Gas Institute.—Annual meeting, Richmond, Va., October 15-17, 1913. Officers President, W. R. Addicks, New York City. Secretary, Geo. G. Ramsdell, 29 West 39th st., N. Y. City.

Canadian Gas Association.—Annual meeting Sept. 1913. Officers: President, Arthur Hewitt, Toronto, Ont.; Secretary and Treasurer, John Keilior, Hamilton, Ont.

Empire State Gas and Electric Association.—Annual meeting, New York City, Oct. 8. 1913. Officers: President, C. G. M. Thomas, Long Island City, N, Y.; Secretary, C. H. B. Chapin, 29 W. 39th street. New York City.

Gas Meters.—Monthly Section Meetings; Grand Commissioner, I. W. Peffly, New York; Gen'l Sec'y, H. Thurston Owens, La Crosse, Wis.; New York Section, Chairman, W. H. Pettes; Secretary, G. E. Smith, Sipp Avenue, Jersey City, N. J. Philadelphia Section; Chairman, L. R. Dutton; Secretary, H. F. Patterson, Jr., 831 Chestnut street. Cleveland Section, Chairman, F. R. Hutchinson; Secretary, Wm. Holtz, East Ohio Gas Co. New England Section, Chairman, T. W. Jennings, Boston; Sec., F. K. Wells, 69 Broad street, Boston. Winona Section, Winona, Minn., W. F. Clausen, Chairman.

Guild of Gas Managers of New England.—Annual meeting, March, 1913. Young's Hotel. Boston; monthly meeting, second Saturday. Officers: President, Walter G. Africa. Manchester, N. H.; Secretary, H. K. Morrison, Brockton, Mass.

Illinois Gas Association.—Annual meeting, March 18th and 19th, 1914. Chicago. Ills. Officers: President, W. F. Barrett, Chicago, Ills.; Secretary-Treasurer, Horace H. Clark, 115 No. Oak Park avenue, Oak Park, Ills.

Illuminating Engineering Society.—Annual meeting,———— September, 1913. Meetings of Sections, monthly. Pres., Preston S. Millar; General Secretary, J. D. Israel, 29 W. 39th street, New York City. Sections: New York, Secretary, C. L. Law, 124 West 42d street. New England, Secretary, H. C. Jones, 10 High street. Boston, Mass. Philadelphia, Secretary, L. B. Eichengreen, Broad and Arch streets Chicago, Secretary, J B. Jackson, 28 North Market street. Pittsburgh, Secretary, J C. Mundo, Oliver Building.

Indiana Gas Association.—Annual meeting, March —— —— 1914. Terre Haute. Officers: President, A. S. Cooke, Terre Haute; Vice-President, A. C. Blinn, Evansville; Secretary-Treasurer, Philmer Eves, Indianapolis.

Iowa District Gas Association.—Annual meeting, May, 1914; ———— Officers: President, B. C. Adams, Lincoln, Neb.; Secretary, G. I. Vincent, Des Moines, Ia.

Kansas Gas, Water and Electric Light Association.—Annual meeting, October—— 1913. ———— Officers: President, L. O. Ripley, Emporia, Kas.; Secretary and Treasurer, W. H. Fellows, Leavenworth, Kas.

Michigan Gas Association—Annual meeting, September, 17, 18, 19, 1913; ———— Officers: President, W. S. Blauvelt, Detroit, Mich; Secretary-Treasurer, Glenn R. Chamberlain, Grand Rapids, Mich.

Missouri Electric Light, Gas, Water Works and Street Railway Association.—Annual meeting, April, 1913; Mexico, Mo. Officers: President, P. A. Bertrand, Joplin, Mo.; Secretary and Treasurer, P. W. Markham, Brookfield, Mo.

National Commercial Gas Association.—Annual meeting and gas show, Dec. 1-6, 1913. Philadelphia, Pa. Officers: President, C. W. Hare, Philadelphia Pa.; Secretary, Louis Stotz, 29 West 39th street, New York City.

Natural Gas Association.—Annual meeting, St. Louis, Mo., May 19 and 20, 1914; Officers: President, E. L. Brundrett, Kansas City, Mo.; Secy-Treas., T. Clive Jones, Delaware, O.

New England Gas Association.—Annual meeting, February, 18th and 19th. 1914, Boston. Officers: President, T. H. Hintze, Providence, R. I.; Secretary-Treasurer, N. W. Gifford, East Boston, Mass.

New Jersey State Gas Association.—Annual Meeting, July —, 1913, Asbury Park N.J. President, C. F. Butcher, Freehold, N. J.; Sec'y-Treasurer, O. F. Potter, Newark, N. J.

Ohio Gas Association.—Annual meeting, February ———, 1913, Columbus, O.; President, John M. Garard, Columbus, O.; Secretary, L. B. Denning, Columbus, O.

Oklahoma Gas, Electric and Railway Association.—Annual meeting, Oklahoma City, May, ——1914. President, F. E. Bowman, Ada; Secretary-Treasurer, H. V. Bozel, Oklahoma City.

Pacific Coast Gas Association.—Annual meeting, San Jose, Cal., September 16, 17, 18, 1913. Officers: President, Henry E. Adams, Stockton, Cal.; Secretary-Treasurer, Henry Bostwick, 445 Sutter street, San Francisco, Cal.

Pennsylvania Gas Association.—Annual meeting, Allentown, Pa., April ———, 1914; Officers, President, J. A. Frick, Allentown, Pa.; Secretary-Treasurer, W. O. Lamson, Jr., West Chester, Pa.

Society of Gas Lighting.—Annual meeting Dec., 11, 1913; monthly meetings, second Thursday. Place, New York City. Officers: President, Fred. S. Benson; Secretary, George G. Ramsdell, 29 West 39th street, New York city

Southern Gas Association.—Annual meeting, Mobile, Ala., April 4, 1914. Officers: President, James Ferrier, Rome, Ga.; Secretary-Treasurer, E. D. Brewer, Atlanta, Ga.

Southwestern Electrical and Gas Association.—Annual meeting. May———— 1914, Galveston, Tex. Officers: President, G. H. Gifford, Fort Worth Tex.; Secretary H. S. Cooper, 405 Slaughter Bldg., Dallas, Tex.

Wisconsin Gas Association.—Annual meeting, May ————1914, Milwaukee. Wis. Officers: President, Ewald Hasse, Milwaukee, Wis.; Secretary-Treasurer, Henry Harmon, Milwaukee, Wis.